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The Financial Implications and Organizational Cultural Perceptions of Implementing a Performance Management System in a Government Enterprise

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THE FINANCIAL IMPLICATIONS AND ORGANIZATIONAL CULTURAL PERCEPTIONS OF IMPLEMENTING A PERFORMANCE MANAGEMENT SYSTEM IN A GOVERNMENT ENTERPRISE

by

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Abstract

The Financial Implications and Organizational Cultural Perceptions of Implementing a Performance Management System in a Government Enterprise

Successful organizations continually seek ways to improve productivity, reduce and control costs, and increase efficiency. Governmental entities also are driven by the need for increased efficiency and accountability in public service for their constituents. There is a continuing need for better tools and a number of government entities have turned to performance management systems due to their promise of improvement in various areas of productivity and accountability. This research focused on one such system, Six Sigma, which has recently experienced widespread adoption in industry in the United States, internationally, and in some government organizations. In this study Six Sigma was compared and contrasted with several performance management systems, and its effects and organizational cultural impacts on one organization were examined.

The study investigated the financial implications and perceptions of organizational cultural change resulting from the Six Sigma system implementation in a large government enterprise. The first part of the study used the organization's published financial information from 1997 through 2006 to determine whether there was a tangible financial benefit of implementing Six Sigma. The analysis indicated that the financial implications were statistically significant and quantified them as material and relevant to the organization's two major business units.

The second component of the research explored differences in organizational culture and attitudes among and between selected employee groups through the use of

interviews and a survey instrument. Interviews were also conducted with a purposive sample of the executives who were involved in the decisions to implement Six Sigma. The *Organizational Culture Inventory*© and *Organizational Effectiveness Inventory*™ survey instruments were used to measure the organizational culture perceptions of the employee groups. Discriminant function analysis results suggested that the various groups shared a common organizational culture, which supports the null hypothesis that there were no differences in the organizational cultural perceptions among the organizational groups investigated.

CHAPTER 1

INTRODUCTION

For most of the last two centuries, business has used non-financial and financial information to guide management's decision making in planning the extent of activities and financing of the organization and controlling the production units and workers. Before the technological evolution of the computer in the 1960s, accounting information was primarily used to plan, forecast, and develop what-if scenarios, while non-accounting metrics and information were geared toward managing activities through tracking the flows and costs through the organization. Now, however, accounting has begun to be replaced by newer forms of performance management incorporating ideas such as Deming's (1982, 1986) continuous process improvement philosophy and its resultant tools.

All successful organizations seek ways to improve productivity, reduce and control costs, and increase efficiency. Government entities in public service also are driven by the need for increased efficiency and accountability to their constituents. There is a continuing need for better tools. A number of government entities have turned to performance management systems due to their promise of improvement in various areas of productivity and accountability. In addition, government enterprises regularly access the municipal finance market through the issuance of tax-exempt bonds, and public disclosure of operating results is an on-going element of the enterprise's activities. This

leads to continuing efforts to develop efficiencies and adopt best practices in order to maintain high investment grade credit ratings.

A recent report entitled "12 Habits of Highly Successful Finance Officers" by FitchRatings affirmed the importance of the practices adopted by management: "in analyzing financial crises of the past 25 years, it is clear that management has had a significant impact on salvaging or exacerbating situations" (Campa et al., 2007, p. 1). Such was similarly reflected in a recent report by Standard & Poor's RatingsDirect research, which stated,

> The New York City fiscal crisis in the mid-1970s caused fundamental changes in public finance practice that, along with SEC rules and GASB influence, continue to affect the industry for the better. The strengthening and clarification of the powers and relationships of government, improved internal and external financial reporting, and better overall risk disclosure have improved the transparency and overall credit of public finance issuers over the long term. (Woodell & Wiemken, 2007, p. 2)

One example of managers' efforts to develop new and better ways of managing performance is the Six Sigma system, which has recently experienced widespread adoption in industry in the United States, internationally, and in some governmental organizations. This system was the focus of the present study. This study investigated the financial implications and perceptions of organizational cultural change resulting from the implementation of the highly-structured Six Sigma system in a large government enterprise.

Background

The recent emergence of Six Sigma as a performance management system is of primary interest to the present study, but this research included the review of other systems as well. Though a growing number of companies are adopting Six Sigma, including such companies as Motorola, GE, and DuPont (Eckes, 2001a); JEA, the Jacksonville, Florida, municipally owned electric, water, and sewer authority that is the site of this study, is one of the few government entities to have used this system. It can be intimated that Six Sigma and the earlier Total Quality Management (TQM) are outgrowths of the scientific management movement begun early in the 20th century, which begs the question: Is Six Sigma the new scientific management?

The scientific management movement was shaped by the works of Fayol (1916/1949), Taylor (1911/1998), Follett (1949), and others who contributed many of the constructs for the management practices constituting the initial sources for management tools. In reviewing the evolution of organizational theories and the scientific management movement, Shafritz and Ott (2001) characterized the era as the "beginning of a continuous search for the most effective means by which people can be organized into social units in order to achieve the goals of their companies, their governments, or themselves" (p. 1).

With the advent of better accounting facilities in the latter half of the 20th century, accounting information for tracking product costs, mix, and sourcing became prevalent. It can be said that managing by using accounting information is similar to looking at the shadows of the business, and that by using such information business was not effectively directing its efforts toward improvements.

Performance management is the process of modifying individual behaviors within an organization so that the organization's goals and objectives are more effectively achieved. Organizational effectiveness is a goal of all successful organizations. Performance management systems are important contributors to the ways in which organizations translate their goals and strategies to their employees and measure achievements (Kreitner & Kinicki, 2001). Further, the manner in which change is introduced is important to any new system implementation. Kreitner and Kinicki described one change model, based on the "landmark work of social psychologist Kurt Lewin," that they considered effective (p. 664). This model described three stages of change: unfreezing, changing, and refreezing, and included Lewin's concept of *benchmarking*, which is modeling an organization on the behaviors of stronger companies in order to achieve the perceived benefits attained by those practices (Kreitner & Kinicki).

In conjunction with the metrics studied, the present study sought to describe any financial implications and benefits as well as any perceptions of organizational culture change effects in the context of the broader implications of performance management systems. The study also investigated the cost avoidance, savings implications, as well as the achievements at the subject organization and then reviewed how these were defined. Finally, the financial performance of Six Sigma and the extent to which the desired benefits were achieved were considered. The examination of Six Sigma was conducted through interviews with leaders and other appointed staff and engineers regarding the financial implications and perceptions of organizational cultural change resulting from the implementation of Six Sigma in their respective units.

The survey questionnaires, the *Organizational Culture Inventory*© and *Organizational Effectiveness Inventory*™ (OCI©/OEI™) were also used for data collection and measurement to provide further information on the impact of Six Sigma on JEA's organizational culture. Since JEA's implementation of TargetSmart (JEA's name for its Six Sigma program), significant progress has been achieved in incorporating it throughout the company so that it now is becoming very well accepted in the organization. It is an organizational expectation that through its implementation, continued progress in changing the organizational culture of JEA from its previous civil service culture to one which more closely resembles the for-profit sector will continue.

JEA employs in excess of 2,300 people, including the staff of St. Johns River Power Park, which is a joint venture electric power generation station of JEA and Florida Power and Light Co., Inc. JEA is a body politic and corporate organized and existing under the laws of the State of Florida and is an independent agency of the City of Jacksonville, Florida (the "City"). In 2005, the latest year for which such information is available, JEA was the eighth largest municipally-owned electric utility in the United States in terms of number of customers.

Six Sigma's process measurement is focused, with continuous process improvement as the objective, and appears to work best with processes characterized by repetitive functionality so that there are enough data points to measure and to determine upper and lower control limits and error rates. This activity was initiated at JEA in 2000, and began to be fully implemented as part of a reorganization in 2001. A close examination of the total impact of Six Sigma (TargetSmart) at this juncture is appropriate and quite possibly important to JEA's achievement of the full potential of the reform.

Statement of the Problem

Employees in today's organizations are well educated, highly trained, and prepared to excel in achieving corporate goals. The Six Sigma system addresses the importance of the managerial and professional workforce and requires rigorous training of personnel at these levels so that proficiency can be realized. Yet, assessments of the impact of Six Sigma implementation are dominated by traditional metrics. Assessments typically do not include the measurement of organizational culture changes. Further, analysis of the systemic impact of Six Sigma in an organization has not been measured at the operating cost level. Table 1 provides an example of the traditional metrics used by Six Sigma, as recently described at JEA, illustrating financial performance since the TargetSmart implementation.

Based on these preliminary data, the indicated payback appears to be excellent, at some 12 times the $12,990,000 in costs. According to an internal rate of return analysis, and assuming all the costs in the initial year with the results achieved evenly over the following 5 years, the program results show an estimated internal rate of return on the costs of the efforts of 188%.

There is a need to analyze and investigate these implied program results by comparing the operating expenditures calculated in relation to units of production separately for the electric system and the water/sewer system over the period of fiscal years 2000-2006, using a baseline average of fiscal years 1997-1999.

Table 1.

TargetSmart Program Results

JEA - TargetSmart Initiative Costs	Unit Cost	Quantity	Total Cost
Initial exploration team costs	$400,000	1	$400,000
1 wave Black Belts (BB) and 3 waves of Green Belt (GB) training costs - Qualtec Contract	1,200,000	1	1,200,000
BB personnel costs for entire program	7,000,000	1	7,000,000
GB personnel costs for entire program	5,000	400	2,000,000
Typical BB project costs (team participation)	5,000	128	640,000
Typical GB project costs (team participation)	3,000	260	780,000
MSI first contract	970,000	1	970,000
Total	$ 9,583,000	792	$12,990,000
JEA - TargetSmart Initiative Results	Expected Benefit		Actual Savings
Typical BB cost: 43 over $100,000 projects	$56,453,715		$56,453,715
Typical GB cost: 53 over $100,000 projects	31,499,555		29,176,084
Impact of projects with < $100,000 savings	N/A		$62,018,273
	$87,953,270		$147,648,072
Return on investment	677%		1137%
Annual rate of return	123%		207%
Internal rate of return, assuming = savings in each period over 6 years	***110%***		***188%***

Source: JEA

Six Sigma Defined

Six Sigma is a rigorous application of principles-based continuous process improvement methods, tools, and statistic-based analyses of processes. Goals include improved customer service and quality, reduced error rates, and increased productivity. This methodology can produce significant benefit to businesses and organizations (Eckes, 2001a). As Eckes (2001b) described it, at some organizations Six Sigma simply means a measure of quality that strives for near perfection. Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects (driving towards six

standard deviations between the mean and the nearest specification limit) in any process – from manufacturing to transactional and from product to service.

The statistical representation of Six Sigma describes quantitatively how a process is performing. To achieve Six Sigma, a process must not produce more than 3.4 defects per million opportunities. In other words, six standard deviations from the specification limit would result in achieving this maximum level of defects per million. A Six Sigma defect is defined as anything outside of customer specifications. A Six Sigma opportunity is the total quantity of chances for a defect [or the number of defects observed for a given process]. Process sigma can easily be calculated using a Six Sigma calculator (Eckes, 2001b).

The fundamental objective of the Six Sigma methodology is the implementation of a measurement-based strategy focused on process improvement and variation reduction through the application of specialized statistical tools on process improvement projects. This is accomplished through the use of two Six Sigma sub-methodologies: Define, Measure, Analyze, Improve, and Control (DMAIC) and Define, Measure, Analyze, Design, and Verify (DMADV). DMAIC is an improvement system for existing processes falling below specification and looking for incremental improvement, and is similar to the Deming/Shewhart Cycles, a six point methodology from which Six Sigma evolved (Deming, 1982; Eckes, 2001b). Both of these tools can also be employed if a current process requires more than just incremental improvement.

Success Factors for Six Sigma

Six Sigma projects and process reviews are executed by Six Sigma Green Belts (GB), Yellow Belts (YB), and Black Belts (BB), and are overseen by Six Sigma Master

Black Belts (MBB), the highest level of expertise. These designations denote progressively greater levels of training and certifications. The BB/GB nomenclature sets this methodology apart; there is quite a lot of technical training required to become a BB. GB training at JEA consists of two introductory courses, then two 3-day GB training classes.

In general, MBBs are typically assigned to a specific area or function of a business or organization. It may be a functional area such as human resources, legal services, or process specific areas. MBBs work with the owners of the process to ensure that quality objectives and targets are set, plans are determined, progress is tracked, and education is provided. At JEA, there are several courses that introduce managers and appointed staff to the statistical measurements used. Those courses culminate in GB training, which is conducted over two separate 3-day training sessions. JEA presently has some 15 BBs working with managers and directors to develop BB and GB projects.

Organizational cultural change in Six Sigma has been conceived of as a breakthrough strategy, as it has been reported as being accountable for changes in firm values and culture.

> In other words, everyday concepts are reorganized and raised to a higher level … however; the everyday concepts that are raised to higher level might not be called everyday concepts after this elevation because they now include elements of more systemic thinking. (Yoshida, 2004, p. 4)

As benefits of Six Sigma, Farooqui (2004) described the need for increased communication, motivation, and specifically, employee education, cited in *12 CriticalSuccess Factors for Six Sigma Effectiveness.* Farooqui (2004) suggested that a

large majority of organizations consider providing financial information as an obligation rather than a product. He stated that applying Six Sigma principles could have a significant impact on perception about the provision of financial information and reporting on internal controls required by the Sarbanes-Oxley Act. By taking a proactive approach, and through considering the voice of the customer (VOC), efforts would be made to enhance the quality and production process of financial information. Additionally, by installing a measurement system such as Six Sigma, the organization would better measure the effectiveness of the internal controls system and this could lead to more satisfied customers, investors, and other stakeholders.

BBs are the heart and soul of the Six Sigma quality initiative. Their main purpose is to lead quality improvement projects and to work full time on those projects until they are completed. BBs can typically complete four to six projects per year and these will have savings goals outlined for each project at the beginning. BBs at JEA are assigned to coach GBs on their projects, which can require a significant amount of time and energy. In addition, each project has a sponsor and a process owner. Process owners are exactly as the name sounds: they are the individuals responsible for a specific process. GBs are employees trained in Six Sigma who spend a portion of their time completing projects, but maintain their regular work role and responsibilities. Depending on workload, they can spend anywhere from 10% to 50% of their time on their project(s).

JEA's Implementation of Six Sigma

JEA is a government enterprise thought to be in the forefront of using education as a means to both improve employee morale and performance, and to develop an awareness of the mission, vision, and values of the organization. The implementation of

organizational culture-based training programs at JEA began a number of years ago and supplemented the technical training, which was very far-sighted. It permitted the emergence of the *reengineering* programs. Reengineering is a process change, which is brought about within a division or a department. Perhaps more broadly, achieving dramatic, breakthrough improvements; the reengineering program may also include the application of new technologies (Hammer & Stanton, 1995). At JEA, an early program encompassing the reengineering concepts was known as WorkSmart; this program was the precursor to the TargetSmart (Six Sigma) process improvement based training. Through these successive reform efforts, there has been no comprehensive analysis of the financial and organizational cultural impacts of the non-financial, highly structured, Six Sigma system implementation.

Purpose of the Study

This study investigated the financial implications and perceptions of organizational cultural impacts of the Six Sigma system's implementation at JEA, the government electric, water, and sewer enterprise of Jacksonville, Florida, and the eighth largest publicly owned utility in the United States. JEA serves a metropolitan area of more than 1,000,000 people.

Additionally, as Six Sigma has been built upon and furthers the process-based, consensus style of TQM this study also considered the following materials as part of the literature review: Detert and Mauriel (1997), *Using the Lessons of Organizational Change and Previous School Reforms to Predict Innovation Outcomes: Should We Expect More From TQM?*; Hammer and Stanton (1995), *The Reengineering Revolution: A Handbook;* and Doran (2003) *Using Six Sigma in the credit department*.

Research Questions

Following JEA's implementation of Six Sigma, the appointed staff was directed to identify processes or projects on which they could develop a GB project. These numbered in excess of 200 projects. The projects took place over approximately 18 months. The object of the first research question of this study was to examine the results obtained from the implementation of Six Sigma and management's expectations of the implementation.

Question 1: What is the cost/benefit to JEA of implementing Six Sigma?

This research question led to an examination of the published financial information for JEA from 1997 through 2006. The data were analyzed to determine whether a tangible financial benefit was discernible. This study analyzed the historical audited financial statements of JEA, using as a baseline the average for fiscal years 1997, 1998, and 1999, and compared the actual operating and maintenance expenses separately for the electric system and the water and sewer system.

Assuming the cost of capital for an organization (at JEA, this is considered to be the interest rate for the fixed rate tax exempt bonds it issues for capital construction), did an organization's implementation of Six Sigma result in improved productivity, efficiency, and in improvements in other financial measurement metrics, such as a reduction in the operating and maintenance expenses per unit of production? Or, did it actually result in the use of more resources than were provided as cost avoidance and savings? The metrics for this phase of the study examined the operating results for those

years just before the introduction of Six Sigma and compared those data over the following years through the published results for fiscal year 2006.

Question 2: Is there a statistically significant difference in organizational culture and attitudes among and between the population's employee groups according to differing degrees of Six Sigma training and levels of prior statistical education?

One definition of organizational culture is "the set of shared, taken-for-granted implicit assumptions that a group holds and that determines how it perceives, thinks about, and reacts to its various environments" (Kreitner & Kinicki, 2001, p. 68). Organizational culture is reflected in the way new employees receive the organizational culture through socialization, how it influences employees at work, and how it varies in the way it is seen and in the resistance to change that employees may evidence (Kreitner & Kinicki).

Significance of the Study

Government enterprise organizations are doing better today than ever in areas such as fuel hedging, diversifying fuel needs, and aggressively managing the financial components of their business activities. In looking at the future, government organizations will be increasingly focused on return on investment, return of investment (payback), and whether a positive return was received on the assets employed. By linking results in program performance and spending budgeted funds to get returns, and through considering whether the project gained improvements in the areas of both operating and maintenance expenses as well as capital project expenditures, it can be determined whether the organization's performance improved and if it was able to cover costs; in other words, whether productivity improved.

One important reason for a government organization to improve performance measurement is the indirect improvement in citizens' (JEA's rate payers) perceptions of government performance: "It seems logical to expect that better government performance will lead to greater CTG [citizen's trust in government]" (Yang & Holzer, 2006, p. 114). Governments that respond successfully to citizens' subjective image of their performance can effectively describe their own objective performance results. Six Sigma's impact on performance improvement is a story that is well worth discussing and one that can help citizens evaluate the efficiency and effectiveness of the organization's management focus (Yang & Holzer).

Many organizations suffer from managerial inertia, and internal change is frequently resisted – even in organizations with a reputation for innovation. Implementation of a new system of performance management is difficult (Koch, 2003). Implementation of a system based on continuous improvement can be particularly vexing due to the difficulty in providing adequate education to the organization's staff. However, "while it may take years and much hand-wringing for it to be adopted at all by an organization … once accepted, … [the system] become[s] part of the generally accepted managerial canon and become[s] very difficult to dislodge" (Koch, p. 326).

Educational organizations can also benefit from closer scrutiny of their operations, and as these statistical tools and techniques become more widely accepted, the accountability and objectivity associated with data driven decisions could be more visibly apparent in the curriculum development and administration, and in the training and knowledge transfer skills of educators.

Method

This study employed a non-experimental, concurrent, mixed method research design using metrics comparisons, semi-structured interviews, and a survey questionnaire to examine the impact of the Six Sigma performance management system implementation at JEA. First, analyses were conducted on the organization's public financial records and reports using both descriptive statistics and traditional financial metrics. This included investigation of any observed cost avoidance and/or savings implications, and/or the achievements. In conjunction with the metrics studied, the study focused on financial benefits, as well as any organizational cultural change effects in the context of the broader implications of performance management systems.

Data collection included the interviews, a standardized culture and climate survey, the OCI©/OEI™ instrument, and a review of organizational documents and various materials collected by the researcher. JEA is a public entity whose records are available through a public records request and no organizational data were used that cannot be obtained under the mandates of Florida's Sunshine Law.

Semi-structured interviews were conducted with the executives involved in the initial selection and implementation of Six Sigma at JEA. The participants were a purposive sample and were not randomly selected. These interviews were retrospective in nature in that the executives were asked to reflect upon their experiences with Six Sigma implementation over the previous 5-year period. Interviews were recorded, transcribed, and analyzed to identify major issues, recurring themes, and recommendations. A questionnaire designed to assess organizational culture and attitudes was distributed to approximately 200 self-selected professional and administrative employees. Survey

instruments were analyzed using descriptive statistics and discriminant function analysis techniques to determine whether significant differences existed among and between the employee sub-groups.

Data were gathered after the event of interest (implementation of Six Sigma) through review of existing publicly published financial data, enhanced by a survey and individual interviews. A qualitative component consisted of interviews, artifact review, and observation in the work setting.

Definition of Terms

1. Six Sigma (TargetSmart at JEA) is a rigorous application of principles-based continuous process improvement methods, tools, and statistically based analyses of processes, with goals including improved customer service and quality, reduced error rates, and increased productivity.

2. GreenBelt (GB), YellowBelt (YB), BlackBelt (BB) and Master BlackBelt (MBB) are training level designations in Six Sigma methodology.

3. Organizational culture is a set of shared values, both espoused values generally established by the executive management of the organization, and enacted values as exhibited by employees through their behavior (Kreitner & Kinicki, 2001).

4. Supply chain methodology is a system of supply chain initiatives used by an organization to more efficiently manage inventory, production, and supply logistics.

5. A balanced scorecard (BSC), also known as a corporate scoreboard, is a performance management system designed to provide pertinent data directly to the decision makers to allow effective measure of the system's success. Six Sigma tracking metrics would constitute such data.

6. The statistical control chart is a statistical technique used to test and monitor the variability within a system or process.

7. Total Quality Management (TQM) is a metrics-based, consensus-oriented management style, a leadership philosophy with a relentless focus on increasing quality in a continual effort to gain improvements in all facets of an organization's activities and operations.

Organization of the Study

Chapter 1 included an introduction to Six Sigma, and a description of the site of the study. It developed the study's examination of the financial implications and perceptions of organizational cultural change as a result of the implementation of the Six Sigma-based performance management system (TargetSmart) at JEA. It also included a description of the evolution of JEA's training program and transitions in the training program over time. Chapter 1 also included some historical background for continuous improvement performance management systems, including TQM's impact on the evolution of performance management systems such as Six Sigma. Finally, Chapter 1 included a description of Six Sigma methodology, the Deming/Shewhart Cycles, and training concepts for GB and BB levels.

Chapter 2 includes a review of relevant literature on several performance management systems and a comparison of those systems to Six Sigma. Topics include a discussion of the following and their respective tools, concepts, philosophies, and similarities and differences: Lean Six Sigma (George, 2002), TQM (Deming, 1982), corporate scoreboard (Gumbus & Johnson, 2003), and reengineering (Hammer & Stanton, 1995).

The study's methodology is discussed in chapter 3, including the research design, study population, research instrument, data collection and analysis, confidentiality for research participants, and delimitations and limitations of the study. Data were collected through the use of survey instruments, the OCI and the OEI™, and interviews of selected participants, as well as through the review of documents and various materials by the researcher. The secondary data, including the publicly available financial data analysis, were examined to analyze the impact of Six Sigma on selected organizational performance metrics.

Chapter 4 includes data analysis and findings related to each research question. In chapter 5, the findings are discussed and their relationship to the current knowledge base on performance management systems is explored. The study concludes with recommendations for practice and suggestions for additional research.

CHAPTER 2

REVIEW OF LITERATURE

This chapter includes a presentation of theory, empirical research, and best practices related to performance management systems and their application to government entities. The concept of continuous process improvement as represented by the work of Deming (1982, 1986) and Deming and Shewhart (1933) is posited as the conceptual framework for the study. Next, organizational culture theory is discussed as it relates to the purpose and goals of performance management systems. The chapter also includes a review of the principles and practices of Six Sigma, the performance management system that is the focus of this study.

Six Sigma Emerges as a Performance Management System

The recent emergence of the Six Sigma system of performance management has modified management practices in many organizations, and appears to have emerged as an organizational culture change agent. Six Sigma is considered to have evolved from Total Quality Management (TQM). It is a continuous process improvement management system with a strong customer focus, and can be initially implemented through extensive on-going mapping of an organization's processes, with a focus on training the organization's employees in the tools of measurement. It also provides for development of the organizational culture necessary to ensure success (Eckes, 2001b).

While there is a growing body of work on how to successfully implement Six Sigma in corporations, little has been written about its use in public organizations. A number of the primary literature sources in the field are reviewed here. Among these are several written by Eckes (2001a, 2001b, 2002), one of the pioneering writers on this subject, including *Making* S*ix Sigma Last: Managing the Balance Between Cultural and Technical Change* (2001a); *The Six Sigma Revolution* (2001b); and *Six Sigma Team Dynamics: The Elusive Key to Project Success* (2002). Eckes (2001b) examined major corporations, such as Motorola and GE, utilizing Six Sigma programs.

Another important subject explored in this review is the issue of resistance to change or anything not familiar, bringing to mind the oft-heard comment, "the only constant is change." Selznick (as cited in Shafritz & Ott, 2001, p. 132) referred to "co-optation" as "the process of absorbing new elements into the leadership or policy-determining structure of an organization as a means of averting threats to its stability or existence" . This study examined the organizational cultural buy-in by the organization and perceptions of whether or how it was achieved.

Underpinning performance management systems is an understanding of organizational culture. Kreitner and Kinicki (2001) presented four functions of organizational culture that provided a way of promoting innovation. Among these is that an organization should give its members an organizational identity in order to seek collective commitments through facilitation of strong corporate values; stability of the social system should be promoted through provision of a positive work environment; and employees' behavior should be shaped through establishment and definition of long-term goals and expectations.

The organizational cultures of companies such as General Electric, 3 M, Motorola, and others have shown the viability of change agents such as Six Sigma and TQM in effectively organizing, controlling, directing, and establishing employee activities while developing a commonly shared sense of mission, vision, and values under which organizations can thrive and prosper (Eckes, 2001b).

Historic Overview: Origins of Continuous Process Improvement

Continuous process improvement and its validation, the basis for TQM and Six Sigma, depend upon the use of the statistical control tools. The first of these was the control chart, invented by Dr. Walter A. Shewhart (1933) – still one of the most important contributions to the field. Shewhart developed the first control charts (Figure 2) at Bell Telephone in the 1920s. Shewhart charts are still used today to test and monitor the variability within a system or process. As a method for analyzing his charts, Shewhart developed his theory of variability and an activity known as statistical process control.

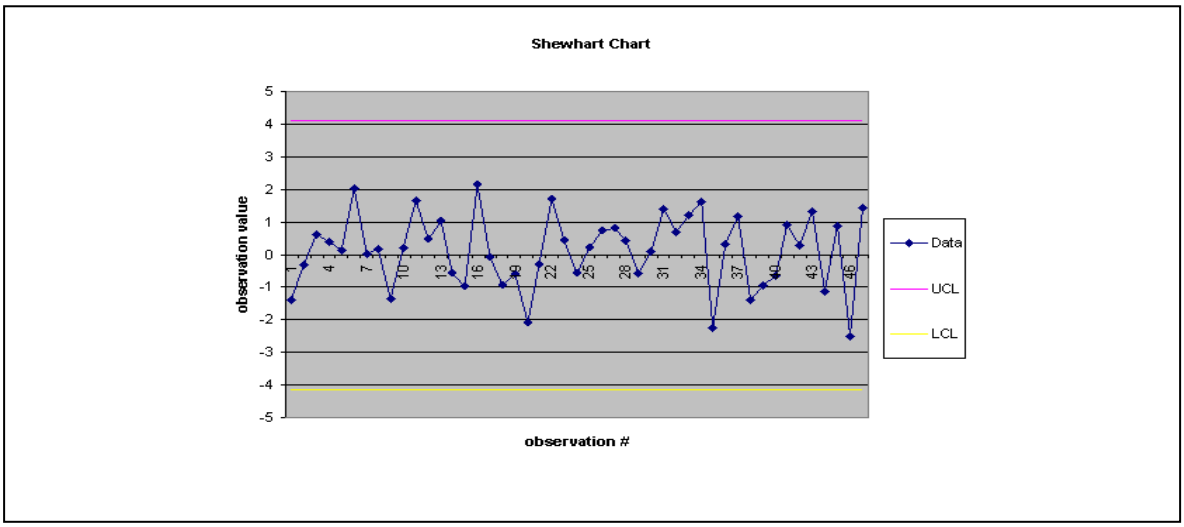


Figure 1. The Shewhart chart.

The technique of using control charts has been widely adapted by businesses throughout the United States and elsewhere (Deming & Shewhart, 1968). Shewhart's charts were adopted by the American Society for Testing Materials in 1933 and advocated to improve production during World War II in American War Standards Z1.1-1941, Z1.2-1941 and Z1.3-1942 (Deming & Shewhart). It was during this period that Deming founded a systematic critique of database management premised on Shewhart's insights. Following the conclusion of World War II, Deming went on to champion Shewhart's methods, working as an industrial consultant to a number of Japanese corporations from 1950 to 1990, and later to several U.S. based corporations. Deming's systematic strategy for business improvement was responsible for a dramatic increase in Japanese productivity over that period (Deming, 1982; Leitner, 1999).

During the 1990s, Shewhart's (and Deming's) genius was re-discovered by a third generation of managers, who named it the Six Sigma approach (Eckes 2001a, 2001b, 2002). The Six Sigma system represents an evolution from TQM, adding a significant factor of statistical analyses, and perhaps more importantly, where TQM was customer focused, Six Sigma has an added concentration on costs and profitability.

Deming (1982) also used and credited Shewhart with what is more widely known today as the Deming Cycle, which Deming introduced in Japan in 1950 as the Shewhart Cycle. The Deming Cycle is a six point cycle of activities for a team, and begins with a series of questions as illustrated in Figure 2 on the following page (Deming, 1982, p. 88).

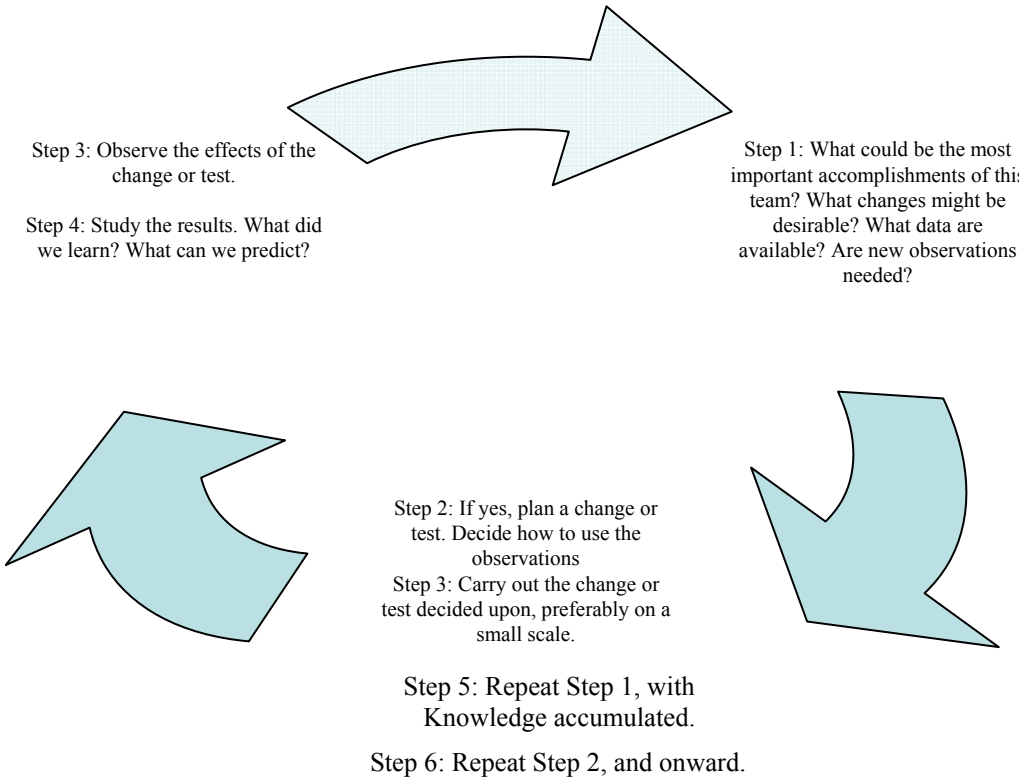


Figure 2. The Deming Cycle, also known as the Shewhart Cycle.

Evans (1996) described Deming's 14 points for management (Deming, 1982), which, as he stated, embodied the components of profound knowledge. Evans said that the application of the 14 points was necessary for achieving system transformation and more effective management, and that the aim of transformation is to change the prevailing style of management (organizational culture). Evans outlined the following four interrelated concepts, which he said composed “profound knowledge”: (a) organization members' appreciation for systems thinking; (b) knowledge about variation within systems; (c) a conceptualized theory of knowledge; and (d) an understanding of psychology.

Organizational Culture Literature Review

Evans' description is supported by Schein (1961, 1993), who suggested that an important key to understanding organizational cultures, subcultures, and organizational learning is dialogue, and that dialogue required organizational cultural understanding. For organizational transformation to occur effectively, dialogue holds a position as a central element. With any effective dialogue, the organization must describe the concept and disseminate it to the group, which must in turn be able to understand it. Schein stated that understanding hinged upon linking dialogue to people's previous experiences. He also stated that dialogue's role in organizational culture transformation was particularly relevant, and that dialogue among organizational cultures and subcultures, transversing hierarchical boundaries, was a high need (Schein, 1988, 1993).

Schein discussed this in the context of coerciveness, where he described a concept of cognitive redefinition, or reframing, with coerciveness as an essential element (Bolman & Deal, 2003). He described this process as generative learning and suggested that this was a version of coercive persuasion required by organizational culture change and organizational learning in order for learners to develop the appropriate paradigms (Schein, 1997, 1999).

Schein (1999) suggested that a learning and innovative organization actually acts to restrict some individual freedom in order to achieve its purpose. He also developed a model for consultant activities to be used in introducing the change agent's agenda and went on to recommend eight overarching principles he considered crucial to the consultant or team leader as part of the transformation (Schein, 1997):

1. Always be helpful;

2. Always deal with reality;

3. Access your ignorance;

4. Everything you do is an intervention;

5. It is the client [manager] who owns the problem;

6. Go with the flow;

7. Be prepared for surprises and learn from them;

8. Share the problem.

Schein (1988) described the concept of organizational socialization, which, he said, refers to the process by which a new member learns the value system, norms, and required behavior patterns of the society, organization, or of the group in which the socialization is meant to occur. He said that organizations' efforts to socialize their new members are through the development of a series of events (at JEA, the company-wide implementation of a performance management system) that can serve the function of changing the activities of the individuals through removing or undoing old values, thus permitting them to learn new ones. According to Schein (1988), this process can be difficult and requires strong motivation to adopt the change and undertake the new learning activity, which, as he stated, could enhance the socialization process. The basic responses to socialization are: (a) rebellion, (b) creative individualism, and (c) conformity. However, in traditional professions like medicine, individualism is supported by professional attitudes that immunize the person against some of the forces of the organization (Schein, 1988).

Cavanaugh and Dellar (1997), in their study of organizational culture, employed 40-minute interviews with a stratified sample of staff, seeking information on characteristics such as system-wide organizational culture, administration culture, and

temporal stability of the organizational cultures. They stated that the "adoption of a quantitative perspective in studying the subjective phenomenon of culture was of consequence" (p. 17).

Organizational culture development and the concept of worker training have been discussed since as early as 1911. Taylor (1911/1998) wrote that "under scientific management, the 'initiative' of the workmen (that is, their hard work, their good-will, and their ingenuity) is obtained with absolute uniformity and to a greater extent than is possible under the old system" (p. 15). Taylor reasoned that workers were more effective at their duties when the science of their activities had been developed, rather than reliance on what he called the old rule-of-thumb technique. His recommendation was to "scientifically select and then train, teach and develop the workmen" and to "heartily cooperate with the men so as to insure all of the work being done in accordance with the principles of the science which has been developed" (p. 15). Managers and the workmen would in some egalitarian way determine the separation of duties so that they would be performed by those best fitted for each task.

An organization's culture is very important, and this was clear nearly a century ago, as the scientific management theory illustrated, and more recently, as Deal and Kennedy (1982) stated,

> The culture of an organization [sometimes] is very strong and cohesive; everyone knows the goals of the corporation, and they are working for them. Whether weak or strong, culture has a powerful influence throughout an organization; it affects practically everything – from who gets promoted and what decisions are made, to how employees dress and what sports they plan. (p. 4)

Later, Deal and Kennedy (1999) wrote,

> True learning occurs most readily in an environment that supports learning as a basic value. The needs of modern employees thus fit perfectly with the interests of a company pursuing the acquisition and exploitation of knowledge as a key to long-term business success. Many progressive companies have made the most of this overlap in needs and interests and have constructed a work environment allowing mutual interests to flourish. (p. 281)

Total Quality Management

History and Background

Following the end of World War II hostilities and Japan's surrender on the *USS Missouri*, General Douglas McArthur established his command headquarters in Tokyo in the Palace Hotel, directly across from the grounds of the Imperial Palace. Having learned a great deal about Japan, McArthur now had the responsibility of assisting the defeated country in writing its new constitution, reestablishing its economy, and finding its way back into post-WW II affairs. Though not a popular sentiment, McArthur stated that the U.S. needed a strong ally in the Pacific and that Japan had learned an immensely important lesson, so he decided to allow the *Zaibatsu* and *Keiretsu* organizations, conglomerate amalgamations of interrelated business, bank, and political systems, to rejoin, thus preparing the way for Deming and the economic structure that emerged as Japan, Inc. (Berk & DeMarzo, 2007; Watkins, 2007a, 2007b).

In 1950, Deming was invited to Japan, where he successfully convinced Japanese executives to adopt his statistic-based quality control system. By 1975, Japan had developed significantly in quality production and achieved high levels of productivity

(Deming, 1982; Shafritz & Ott, 2001). Though Japan's social and cultural heritage was nationalistic, and historically Japan had not been an outward looking country, Deming's ideas were quickly adopted as the need to reestablish manufacturing was crucial to the country's survival and to the regaining of prosperity for its citizens (Deming, 1982). The country had effectively *reengineered* itself (Deming, 1982; Leitner, 1999), a term described by Hammer and Stanton (1995) as a radical transformation. For Japan, this was truly a new management and cultural effort, and resulted in the resumption of its previous manufacturing capabilities and its becoming a world leader in productivity gains through much of the remainder of the 20th century.

Leitner (1999) stated that Deming was not operating without visible opportunity as the outbreak of the Korean War had provided a politically suitable reason to reinvigorate and modernize Japanese manufacturing facilities. The U.S. government had started a program of directed procurements to provide the United Nations forces fighting in Korea with the replenishment of arms and munitions needed to continue the war effort (Leitner). According to Leitner, Deming was dispatched to Japan in 1947 to assist the U.S. occupation forces with the upcoming census. Leitner described Deming's successes in explaining his concepts to the Japanese during this period. The Japanese took readily to the infusion of statistical process measurements of the organizations' activities, and also to the culture of quality that TQM embodies, so that the philosophy of quality work throughout production became an intrinsic part of their programs (Leitner).

TQM is structured to deal directly with systems barriers, prescribing organizational design changes and a social-technical approach including the forming of an implementation committee and designation of a design team that is broadly

representative of the entire organization. The team then reviews and assesses the organization's culture, systems, environment, and other factors, and develops recommendations for the organization to consider. These recommendations may include self-directed work groups, compensation changes, or reorganization from a linear heritage to a quality product/customer service driven base of activity, for example (Deming, 1982).

Zairi (1995) stated, "For many individuals and organizations the beliefs upon which today's change initiatives are based represent a transformation, a discontinuous break with existing individual and collectively held paradigms" (p. 177). The transformation for U.S. manufacturing companies came late. Deming's transformational ideas were mocked by the U.S. corporations until the latter part of the 20th century, when Japan's gains became widely recognized. It was at that point that Corporate America began to focus on quality and on productivity in any meaningful way (Deming, 1982).

Tools, Principles, and Concepts

Total Quality Management (TQM) includes a wide variety of tools, such as brainstorming, control charts, data analysis, histograms, multi-voting, Pareto charts, priority matrices, and scatter diagrams, among others (Deming, 1982). In addition to those listed by Deming, Laframboise (2002) credited Deming for furthering the tools and techniques of affinity diagrams, interrelationships digraphs, tree diagrams, matrix diagrams, quality function deployment tools, cause and effect diagrams (Fishbone), simulations, and others.

Deming's 14 points. In a review of Deming's 14 points, Shafritz and Ott (2001) referred to them as a leadership philosophy focused on a relentless effort to improve

quality and continually gain improvements in all facets of an organization's activities and operations, including the areas of production, customer services, processes, and communications, both within the organization and externally. Along with Deming, they also offered a list of major components necessary for an organization to achieve quality results: leadership, a strong and systemic customer focus, continuous improvement efforts through employee empowerment, and management by assessment of facts rather than subjectively (Deming, 1982; Shafritz & Ott, 2001).

Deming's 14-point philosophy of managing an organization as summarized by Shafritz and Ott (2001) is as follows:

1. Create constancy of purpose for improvement of product and service.

2. Adopt the new philosophy.

3. Cease dependence on mass inspection.

4. End the practice of awarding business on the basis of price tag alone.

5. Improve constantly and forever the system of production and service.

6. Institute training.

7. Adopt and institute leadership.

8. Drive out fear [of change, of speaking out, of taking risks, of asking questions].

9. Break down barriers between staff areas.

10. Eliminate slogans, exhortations, and targets for the work force.

11. Eliminate numerical quotas for the work force and numerical goals for people in management. [This also refers to eliminating managing by objectives.]

12. Remove barriers … [to] pride of workmanship. [People want to do a good job, and want recognition for a job well done.]

13. Encourage education and self improvement for everyone.

14. Take action to accomplish the transformation. (p. 427)

Deming (1982) stated that organizations faced two sets of problems; those needing to be dealt with immediately and those that would be present in the future. Deming said the "problems of the future command first and foremost constancy of purpose and dedication to improvement of competitive position" (p. 25) regarding his conviction that the need to meet future problems was the more important of the two. He placed as a priority the allocation of resources for future planning, research, and education. He also described the need to continuously improve product designs, service, and customer focus, so that the organization never loses sight of customer needs.

Along with Deming's (1982)14 points, he recommended developing profound knowledge as part of transforming the prevailing style of management. Profound knowledge is composed of four interrelated concepts: (a) organization members' appreciation for systems thinking; (b) knowledge about variation within systems; (c) a conceptualized theory of knowledge; and (d) an understanding of psychology (Nelsen & Daniels, 2007, p. 32). Another tool used by Deming was the aforementioned Deming cycle: plan, do, check, and act (PDCA) (Shafritz & Ott, 2001, Nelsen & Daniels, 2007).

Deming's seven deadly diseases. Deming (1982) described "seven deadly diseases" that were exhibited by Corporate America:

1. Failure to provide adequate human and financial resources to support the purpose of quality improvement;

2. Emphasis on short-term profits [and shareholder value];

3. Evaluation of performance, merit rating, or annual review;

4. Mobility of management, job hopping;

5. Management by use of only visible figures, with little or no consideration of figures that are unknown or unknowable;

6. Excessive medical costs; and

7. Excessive legal costs. (pp. 97-98)

Awards for quality. Corporate America during the 1970s and 1980s was not known for its quality control. While there were a number of examples of very well managed companies, such as General Electric and Emerson Electric, many others were not well managed. Those that were generally well managed were engineering oriented companies with goals of building strong product reputations, quality control, and cost containment.

In the late 1980s, under Ronald Reagan's administration, quality finally began to gain recognition as a desirable achievement for U.S. corporations. Reagan instituted the Malcolm Baldrige National Quality Award in 1987 for quality in several categories including manufacturing, service, and small business, to recognize U. S. companies that demonstrated outstanding quality achievement and quality management (Wilson, 1997). The award was a major factor in encouraging improvement in business performance.

Six Sigma – TQM on Steroids

Perez-Wilson (1999) described Six Sigma as "many things: A statistic, a metric, a strategy, a benchmark, a vision, and a philosophy" (p. 177). It is "an optimized level of performance approaching zero-defects in a process producing a product, service or

transaction. It indicates achievements and maintenance of world-class performance. Six Sigma is not a methodology it is an end not a means" (Perez-Wilson, p. 177). For Motorola, the term Six Sigma expressed a process capability with a defect rate of only 0.003 defects per million units of production (Perez-Wilson). Laframboise (2002) referred to Six Sigma as both "a statistical tool and a philosophy of quality" (p. 31).

> In the Six Sigma program, a higher number of sigma denotes a more stringent result. Thus as sigma increases, reliability improves, the need for inspection diminishes, work in progress [often called rework] declines, costs go down, cycle time goes up, and customer satisfaction goes up. (Laframboise, p. 32)

As discussed earlier, Six Sigma is an extension of TQM that encompasses a much greater statistical metric basis geared toward continuous process improvement. Extensive training in statistical measurement techniques, including Pareto charts, control charts, ANOVA/ANCOVA/MANOVA/MANCOVA analyses, and other tools is required. Six Sigma emphasizes process controls, examines whether processes are stable, reviews data from processes to assess variances, and focuses on detecting potential problems before they occur. Focused on defect identification and reduction, it is significantly more complex in its measurements than TQM and relies heavily on statistical analyses (Eckes, 2001b).

Eckes (2001a) stressed defect detection as a crucial point, particularly in regard to the need to improve processes. Defects results in rework costing extra time and workload and possibly extra material. Also, frequently it is the customer who discovers the defect, which may have a number of significant results. These results may include possibly the loss of the customer, or at least some goodwill, the need to take the faulty product back

and/or rework causing, among other things, dissatisfaction, loss of customer confidence, increased costs, and reduced productivity.

In an empirical study by Lin and Lu (2005) in which they reviewed virtual organization in the context of e-business methodology, the researchers examined the structural changes undertaken by these organizations in order to better manage their activities. Two of the structures they discussed were vertical integration – electronically connecting the organization and its suppliers – and virtual organization, which they described as a collection of diverse entities linked by electronic communication with lateral relationships of coordination. The example they gave was Toyota Motors. Toyota and its suppliers communicate electronically and are connected through the master production scheduling system. Structures such as these enable diverse entities to operate as what may be described as a super team, and the main ingredients necessary for their success are communication and trust (Lin & Lu, 1995). This places emphasis on "professionalism that reflects professional knowledge of administrations and other organizational members … [which have] … been identified as a determinant of innovation in various industries" (Lin & Lu, 2005, p. 190).

Supplier cooperation is strongly encouraged under the Six Sigma operating strategy, and this element of Six Sigma includes incorporating an organization's suppliers into the customer focus activity. Organizations implementing Six Sigma frequently form alliances with suppliers allowing them to assist the organization in meeting its goals (Eckes, 2001b, 2002).

For continuous process improvement to work, management must empower employees so they are willing to innovate and act in an atmosphere of trust and respect.

Without empowered employees, all of the other components can be in place, but Six Sigma will fail. Employees who are motivated to improve service to their customers with a climate allowing them to do so are a potent combination (Eckes, 2002).

Six Sigma Statistical Tools

Six Sigma uses the Deming cycle's PDCA concepts in its problem solving and problem prevention cycle, where the major elements are: gathering information, analysis prior to action, brainstorming and evaluating the ideas generated, and evaluation of success (Deming, 1982, 1986; Eckes, 2002).

Pande, Neuman, and Cavanagh (2000) described in some detail the statistical tools that can be used in Six Sigma:

1. Statistical Process Control and Control Charts [which they consider as the problem identification tools];
2. Tests of Statistical Significance [including Chi-Square, *t*-tests, and ANOVA aiding in problem definition and root cause analyses];
3. Correlation and Regression [for root cause analysis and predictive results];
4. Design of Experiments;
5. Failure Modes and Effects Analysis [assisting in prioritization of problems and prevention];
6. Mistake-Proofing [including defect prevention and process improvement tools]; and
7. Quality Function Deployment [for product, service and process design activities]. (Pande et al., pp. 355-356)

Six Sigma's employee training is meant to develop an understanding of the statistical attributes needed to fully use the process measurement and defect prevention and improvement capabilities of this scientific management method. It also is tempered with a number of warnings that this system should not be less than a fully underwritten effort – half-hearted effort will not generate significant results – and top management must be fully engaged in all aspects to see the real benefits that accrue to the system (Eckes, 2002).

Management's Importance in Organizational Culture Socialization.

George (2002) described Andrew Carnegie's understanding in 1885 of quality and elimination of variation at the Carnegie Steel Company (the predecessor of U.S. Steel Corporation) as a competitive advantage and suggested that the element that Carnegie failed to address was that of including his workers as part of the team. It was later that Fayol (1916/1949) and Taylor (1911/1998) stressed the importance of employees and their training as important to a company's success (Shafritz & Ott, 2001). The organizational cultural aspects of Six Sigma with emphasis on employees as part of a team are crucial to Six Sigma's well-founded reputation for leading to lasting business leadership and top performance (Eckes, 2002).

The use of Six Sigma's new technology is a logical, evolutionary extension of the work first presented by Taylor in 1911 (1911/1998). Organizations today wrestle with complex dilemmas about how deeply to participate in the information age. These dilemmas include such issues as whether to centralize or de-centralize, out-source or produce, and use regular employees or contract employees. An atmosphere conducive to

creating cooperative behavior must be established in order to thrive in such an environment.

Bolman and Deal (2003) offered a list of defining characteristics of an effective leader in a knowledge based, global society including the leader's own self-actualization in addition to the ability to develop and encourage work teams, enable employee empowerment and ascertain the effects of work environments on individuals as part of helping them be more productive. Specifically, Bolman and Deal stressed the importance of human resource management's ability to obtain employee buy-in and promote teamwork through responsiveness, support, and empowerment. Blanchard (2003) and Northouse (2004) also pointed out the benefits realized by empathetic leaders with strong communication and relationship skills who were responsive to the needs of employees. According to McGregor (1960), strong management is able to promote a high degree of participation and team work, thus satisfying a basic need of employees to be involved and committed to their work.

In a study considering the performance effectiveness of management, Cook and Emler (1999) concluded that competent performance in a leadership position required a capacity to enact ethical standards and an ability to interact face to face. They wrote,

> If the effectiveness of managers is a function of how they treat their subordinates and whether they secure the trust and confidence of those subordinates – the confidence of the latter that they will be treated fairly, that promises to them will be kept, that their welfare will be considered, that they will be told the truth – then conventional top-down methods … will systematically under-select the best potential performers. (p. 438)

Cultural motivation and resistance. Hackman and Wageman (1995) acknowledged that TQM provided an appropriate balance between employee participation and management; however, they observed an element of resistance to the top-down orientation of TQM. One common effect noted when process changes were implemented was that often the initial process was not as well done, which usually resulted in an aggressive reversion to the previous techniques. In other words, the new techniques were resisted, and the usual behavioral activities persisted (Hackman & Wageman). They also cautioned against the use of explicit goal setting and over-dependence upon pay for performance as motivators.

In a recent article on cultural resistance to change, Kemp, Walker, Astin, and Lindholm (2001) stated that "culture proves to be a critical component in understanding the process of planned change and transformation" (p. 2). The authors discussed the cultural components of various types of institutional culture, and emphasized the importance of understanding organizational culture when initiating change. In describing resistance to change, the concept of organizational structure understanding is important to the analysis of the element of resistance, and they described elite, meritocratic, or leadership-style value structures as more likely to view change negatively, versus a collegial structure, which they felt would view change in a more positive way.

The Balanced Scorecard (BSC). The BSC, also called the corporate scoreboard, is a performance management system tool designed to provide data directly to the decision makers. The data are tailored to the needs of the company to facilitate effective system measurement. Laframboise (2002) described the process as contributing to an

organization's efforts to "have the greatest impact on customer satisfaction, i.e., reducing cycle time, improving quality, employees' skills and productivity" (p. 34).

Attributed to Kaplan and Norton (1996), the name BSC "was derived from a study group they led in the early 1990s, and is organized around four distinct perspectives – financial, customer, internal, and innovation and learning" (p. viii). As a strategic framework for action, the BSC required (a) "clarifying and translating vision and strategy; (b) communicating and linking [setting goals and linking them to rewards]; (c) planning and target setting; and (d) strategic feedback and learning" (Kaplan & Norton, 1996, p. 11). Describing the BSC as a change instrument, Kaplan and Norton (2001) wrote,

> [It is] most effective when it's part of a major change process in an organization. Adopting the new measurement and management system helps leaders communicate the vision for change and empower business units and employees to devise new ways of doing their day-to-day business to help the organization accomplish its strategic objectives. (p. 6)

Kaplan and Norton noted further that

> The BSC has also been applied by nonprofit and government organizations. One of the barriers to applying the scorecard … is the considerable difficulty … [they] have in clearly defining their strategy. We reviewed "strategy" documents of more than 50 pages. Most of the documents, once the mission and vision are articulated, consist of lists of programs and initiatives, not the outcomes the organization is trying to achieve. (Kaplan & Norton 2001, p. 101)

According to Kerr (2003), research has proven that companies are ineffective, or experience breakdowns, due to poor management. There are many different ways to manage a company; however, effective management strategies have one thing in common: the ability to quantify and track processes that directly impact the company's ability to meet its desired goals and objectives. Kerr described how the Texas State Auditor's Office successfully implemented the BSC in all four quadrants (learning, innovation, and growth; customer service; financial; and internal operations) of its operation. Kerr's research focused on breaking down the scorecard implementation process from determining objectives, obtaining customer needs, organizing the scorecard, teaching employees and managers, and presenting the data in an organized fashion so that managers would be able to use it to make quick and effective decisions. She concluded that the benefits to the State Auditor's Office of implementing the BSC were obvious: "Simply put, the office now measures only what really matters, its staff members know what they need to do their jobs better and accountability is a part of everyday management" (p. 71).

Gumbus and Johnson (2003) sought to learn how the BSC can be used specifically in the learning, innovation, and growth quadrant in their case study on Futura Industries. Due to its emphasis on quantitative data, it is common to see the BSC used to measure customer service, financial, and internal operations. According to Gumbus and Johnson, Futura "is all about putting people first," particularly in regard to its employees (p. 37). They examined how Futura implemented and tracked policies focused on the growth of its employees. They concluded that companies do not focus enough on the

learning, innovation, and growth dimension of the BSC and stated that focusing on this quadrant provided a much improved workplace for employees, thereby increasing productivity.

Both Gumbus and Johnson's (2003) and Kerr's (2003) studies were conducted primarily using interviews with the organizations' employees and company data as the basis for their research. All of the researchers concluded that, if implemented correctly, the BSC is a very effective means to quantify and track data in a timely and efficient manner to allow quick decisions to be made by managers. JEA's fiscal year 2006 BSC is shown in Appendix III.

Supply chain performance management system. In a longitudinal case study, Bay, Tang, and Bennett (2004) considered the use of supply chain methodology in managing the inventory for Seagate Technology International's Singapore manufacturing facilities. Their study focused on Seagate's use of three main initiatives: time to market (product development), supply chain management, and Six Sigma initiatives for quality management. They described Seagate's supply chain management implementation strategy as consisting of several stages. Stage 1 involved top management's commitment to the process. Stage 2 focused on identifying Seagate's strengths, weaknesses, opportunities, and threats. Stage 3 focused on developing the strategy, while stage 4 focused on creating the organizational culture. Stages 5 and 6 were the action stages, focusing first on managing the change and then on developing and training the team. Bay et al. reported that Seagate still had much to learn regarding "scanning the environment, anticipating demand variations and being fast in adapting to change. Seagate can mitigate

the risk and maintain sustained growth through successful implementation of supply chain management in order to be very responsive to its customers' needs" (p. 339).

Lean Six Sigma. A new form of performance management system has evolved from Lean manufacturing known as Lean Six Sigma (Nave, 2002). Lean Six Sigma combines the two concepts of making work better through continuous process improvement (Six Sigma) and making work faster (Lean principles) (George, Rowlands, & Kastle, 2004). Lean Six Sigma's principles include, "delight customers with quality and speed [TQM]; improve your processes [Six Sigma] by reducing variation and defect and eliminating bottlenecks which impede process flow; work together for maximum gain [teamwork]; and base decisions on data and fact [Six Sigma]" (George et al., pp 11-34). The authors went on to prescribe what managers must do to achieve the benefits of the Lean Six Sigma initiative: "pick the right projects; pick the right people; follow the method; clearly define roles and responsibilities; communicate, communicate, communicate; and support education and training" (p. 84). Another writer, Devane (2005), also described this as including picking the right projects, people, method and principles in the context of organizational improvement, reviewing the integration of Lean principles with Six Sigma in what he described as high-performance improvements in organizations.

Introduction of Six Sigma Performance System at JEA

JEA's present comprehensive organizational culture began with the CEO who assumed the leadership of JEA in 1994. Previous management had guided JEA from being poorly run to being very well run from the 1980s through the 1990s, when JEA began to focus on customer satisfaction; a focus that current management has continued

and expanded upon. Building on these earlier successes in recent years, JEA continued organizational culture change efforts; emphasized the need for improved customer service; raised standards and developed its present vision, mission, and values; employed market research and benchmarking; and established the organization's roadmap.

The implementation of Six Sigma at JEA was done in conjunction with a major October 1, 2001 reorganization. At that time, a newly formed executive management team (EMT) was installed, a structure which became more organic over time. Organic organizational structures "are flexible networks of multitalented individuals who perform a variety of tasks" (Kreitner & Kinicki, 2001, p. 640). The authors also defined the opposite of organic organizations, mechanistic organizations, as "rigid bureaucracies with strict rules, narrowly defined tasks, and top-down communication" (2001, p. 640).

Senge (1990) described the successful organization of the future as an organism with the developed capacity to continually enhance its capabilities and shape its own future. The learning organization, at its core, would be a complex organization, perhaps a company, association, church, school, or government agency, which is a complex organic system, and which understands itself. The organization would have a conscious vision and purpose and would be aware of its feedback systems and alignment mechanisms, as well as organized in the use of them. "The essences of the disciplines are the state of being that comes to be experienced naturally by individuals or groups" (Senge, p. 374). In this regard, the pyramid that Senge described has an organizational base of practices – system archetypes and simulation; principles – supporting structures influencing behavior, policy resistance, and leverage; and finally, essences – holism and inter-connectedness.

> The disciplines of building shared vision and team learning differ from the other three in that they are inherently collective in nature. The practices are activities engaged in by groups. The principles must be understood by groups. And the essences are states of being experienced collectively. (Senge, p. 375)

Similarly, Argyris (1971) stated

> People in our society, through their acculturation and education, are programmed to behave according to … pyramidal values. This means that if people are brought together to participate … they will tend to be blind about their contribution, but aware of the contributions of others.… Participation can become effective if human beings are helped to develop the skills and the self-acceptance required. (pp. 185-186)

The organizational culture, systems, and structure of JEA are presently a working blend of both mechanistic and organic structures. In some respects, with over 200 appointed managers, the organizational structure remains oriented toward the mechanistic form. On many organization issues, JEA uses a mechanistic bureaucratic management style; however, with individual managers, the application of Six Sigma has permitted broader latitude and made people more bottom-line oriented – and, within boundaries, front line managers are empowered to do what they need to do. The strategic level is fairly organic and the management team is free to come up with ideas and change, allowing leaders within the group to take control – although even within that context, JEA continues to exhibit strong top-down leadership.

JEA's EMT operates as a collegial group and is transitioning into a more structured environment. The chief executive officer (CEO) is externally focused, very

involved in strategic matters, and is a strong champion of internal activities and functions and of growing and developing leaders internally. The CEO, chief operating officer (COO), and the other three chief executive positions run JEA from day to day. The next level of management is process based, charged with mutual responsibility for management, and understands the need for cooperation with others to run their respective areas of responsibility.

In line with the main precept of TQM that an organization must strive for incremental process improvement on a continuous basis (Eckes, 2001a), JEA moved from reengineering, introduced at JEA in the late 1990s as WorkSmart (Hammer & Stanton, 1995), to implementing the Six Sigma continuous process improvement methodology. Even with an understanding of the need for continuous improvement, JEA's Six Sigma based reorganization in 2001 was radical when introduced.

Argyris (1982) posited the use of a research program designed to help understand, and then alter, the reasoning and learning processes of individuals and organizations. JEA, in its several activities, whether it was the Covey training, the WorkSmart program, the reengineering activities, or the more recent Six Sigma program, has been an early adopter of change management programs in its efforts to find ways to improve its operating activities and develop a stronger corporate organizational culture. Training of a number of types has aided in these efforts.

The training curriculum. Continuous training is a critical element in Six Sigma, as it is in the commencement of any statistically based continuous process improvement structure. Without a long term training program, no organization will be able to successfully implement Six Sigma. According to Perez-Wilson (1999), the full

implementation of Six Sigma takes a number of years. It is a full blown intensive training program involving people throughout the organization. For example, "Motorola in 1987 set a 5-year target to achieve Six Sigma. General Electric [in 1996] set itself a goal of becoming a Six Sigma quality company by the year 2000" (p. 329). At JEA, in October 1998, the 1999 annual training calendar for general employee development encompassed some 40 courses reflecting five major areas of focus. At that time, the technical training for the electric, water, and sewer systems' employees was not included under the calendar, and was conducted separately at the West Side Service Center and at St. Johns River Power Park (SJRPP) locations. In comparison to the training program in 1999, the Six Sigma-influenced program in 2006 offered over 120 courses.

Reengineering at JEA. The earlier reengineering WorkSmart program, JEA's unique customized program, was considered to have been successful. The researcher in the present study was the team leader of three WorkSmart reengineering teams: two in the human resources area and one directed toward designing and implementing an electronic time sheet. These three projects were successful in substantially reducing rework and the number of processes for each activity, as well as improving the productivity of the activities. However, though WorkSmart was an organic change program, it was not completely functional. While it had some impact and successes, it was not rolled out to the entire organization, but was used primarily at the departmental levels. It could be argued that JEA's organizational realignment of 2001 was reengineering, as the organization built a new structure and reengineered JEA from ground up.

Six Sigma is introduced at JEA. TargetSmart, JEA's name for its unique implementation and deployment of Six Sigma, was envisioned to be taken much deeper into JEA's organization than has been the case with many other companies who deployed Six Sigma. JEA undertook a two-pronged approach: first, through mapping all of its more significant processes – over 1,000, then through implementation of a "holistic everything, everyday" process-based improvement program tracking some 5,000 metrics.

The second prong, still ongoing, consists of using a "demand controlled" method of doing projects on both BB and GB (higher and lower) levels focusing on improving all of JEA's most significant processes through detailed reviews, so that important processes gain visibility. The more than 5,000 metrics are tracked and reported on the individual manager's scorecard electronically through an intranet system developed for it by MindSolve Technologies, Inc. Imported into the data management system, the scorecard is used to track individual performance against the annual goals set by the organization. It provides managers from the top down an ability to "drill down" [investigate closely the underlying details] in the company, and is designed to provide a reporting system to assist management at JEA to see, do, act, collect data, and manage processes, in order to help the organization manage and achieve its targets and goals. It is a diagnostic tool to help the organization identify areas where it needs to improve.

The training curriculum expansion to GB, YB and BB. In 2000 there were three training catalogs of courses, with one for the downtown Jacksonville administrative staff that consisted mostly of "soft" skill organizational culture and leadership courses. During this period, the first wave of the introduction of Six Sigma (TargetSmart), senior management underwent "Champion" training as YBs as the first to be trained in this new

statistical and numerical system of process improvement. This training was to help Champions determine what programs and which projects were to be undertaken by the first group of 10 BBs trained at JEA. It also included an overview of the Six Sigma training.

Following the beginning of TargetSmart was mandatory training for all appointed staff ("at will" employees not represented by a bargaining unit who can be asked to resign). The initial introduction of the Six Sigma training to JEA's appointed staff was done by a vendor, *Qualtec Six Sigma*, under its "Instructional System Diagram Development" curriculum. These training programs were developed under the auspices of an ad hoc committee tasked with researching vendor programs. No one on the committee had any training experience. During the summer of 2001, all appointed staff were asked to reapply for positions within the company. A broad based reorganization of the staff ensued, and a few individuals were not able to find a new position and subsequently left or retired.

The first course, which began with the Champions, was called Process Analysis and Control Charts and then a second course, Basic Tools and Techniques. The ad hoc committee decided that YB training should include these two courses and they also extended, initially, the number of days of training. This training was meant to be the introduction for continuous process improvement training and TargetSmart's basic tools for all appointed staff and senior management.

During fiscal year 2001, the first BB training group received certification and the GB training program for all appointed staff was begun. JEA's training staff gained expertise and assumed the entire GB training program, which resulted in training cost

savings. All appointed staff were required to have completed both GB training and a GB project by September 30, 2004.

The non-appointed staff, primarily the engineers, were also expected to take the GB training. The GB projects, on which the appointed staff would be learning Six Sigma hands on, would be within the individuals' process areas. All the employees who would be doing these projects would first take the Process Analysis and Control Charts/Basic Tools and Techniques training, which was then 14 days in length. Appointed staff were required to complete this training within the first year of implementation and the engineers were to complete Process Analysis and Control Charts in the first year and Basic Tools and Techniques in the second year.

JEA has now developed a training matrix for scheduling management training that lists the expected competencies taught including leadership skills such as coaching and motivation for management organizational culture training and to enhance management skills. This matrix is intended to provide a tool for management to use during two-way feedback sessions examining individuals' competencies and needs, and facilitating development of specific training plans to address and meet individuals' training gaps. Among the benefits of this matrix were scheduling, tailoring training to meet needs, reducing the number of classes needed, identifying the correct participants, and allowing individuals to test out of required courses.

Chapter Summary

The review of the literature underscored the significance of the present study in several ways. The concept of continuous process improvement, as represented by the work of Deming and Shewhart (Deming, 1982, 1986; Deming & Shewhart,1968) was

posited as the conceptual framework for the study. Next, organizational culture theory was discussed as it related to the purpose and goals of performance management systems. A review of the principles and practices of Six Sigma, the performance management system that is the focus of this research was also presented.

The recent emergence of the Six Sigma system of performance management has modified management practices in many organizations, and Six Sigma appears to be an organizational culture change agent. The literature review underscored that performance management systems are best understood when organizational culture is taken into account. The organizational cultural components of various types of institutional culture were presented and the importance of understanding organizational culture when initiating change was emphasized. Several performance management tools such as BSC, Supply chain performance management system, Lean Six Sigma, and Six Sigma were described as processes used by organizations to help them manage productivity and growth.

Finally, training was presented as a critical element in the commencement of any statistically based continuous process improvement structure, and it was concluded that without an effective long term training program, no organization can successfully implement Six Sigma.

CHAPTER 3

METHODOLOGY

The present study examined the implementation of a performance management system in a large government enterprise by investigating both the financial and organizational culture impacts of the implementation. The performance management system of interest, Six Sigma, was adopted by JEA, the eighth largest publicly owned electric, water, and sewer authority in the United States, in 2001. This chapter provides a detailed description of the research questions, design of the study, research population, data collection and analysis, and limitations of this work. Participant confidentiality and other ethical considerations are also discussed.

Research Questions

Two research questions guided this study of the impact of Six Sigma implementation at JEA:

Question 1: What is the cost/benefit to JEA of implementing Six Sigma?

Question 2: Is there a statistically significant difference in organizational culture and attitudes among and between the population's employee groups according to differing degrees of Six Sigma training and levels of prior statistical education?

The first research question was addressed through financial analysis of existing data. The second question was addressed in two ways: first, qualitative interviews were conducted with a small sub-set of the research population; and second, the

Organizational Culture Inventory© and *Organizational Effectiveness Inventory*™ (OCI©/OEI™), a standardized survey instrument, was administered to the research population.

Design of the Study

A mixed method design was employed in this study. Mixed method research combining quantitative and qualitative research is one form of triangulation. "Quantitative and qualitative data could be collected separately in two phases so that data from one source could enhance, elaborate, or complement data from the other source" (Creswell, 2002, p. 562). Creswell described an exploratory mixed method design as combining the elements of the quantitative data and then utilizing the qualitative data to confirm or elaborate upon the results. "The rationale for this approach is that the quantitative data and results provide a general picture … [and] more analysis, specifically through qualitative data collection [can] refine, extend, or explain the general picture" (p. 566).

The study was conducted in several phases determined by availability of the financial data and accessibility to the research population. The first phase included the financial analysis of the operating expenditures, calculated in relation to units of production separately for the electric system and the water and sewer system over the period consisting of fiscal year 2000 through 2006, using a baseline average of fiscal years 1997-1999. The second phase consisted of semi-structured interviews that were conducted with 10 JEA management members. In the final phase 200 employees of JEA were provided a paper and pencil standardized questionnaire to complete and 97 (47%)

were completed and returned. A discussion of the procedures associated with each phase follows.

Methodology of the Quantitative Phases

The quantitative methodology used in this study was of two types, a financial analysis and a standardized survey instrument. The financial analysis was conducted using traditional financial metrics and JEA's publicly disclosed financial statements and schedules, shown in Appendix IV. Actual operating and maintenance expenses were analyzed for each of the two major systems of JEA: the electric system and the water and sewer system, over the period from 1997 through the published results for fiscal year 2006, to determine whether productivity and efficiency had improved as a result of Six Sigma implementation. The research also explored whether improvements were experienced in other financial measurement metrics, such as a reduction in the operating and maintenance expenses per unit of production, or whether more resources were used for Six Sigma than were provided as cost avoidance and savings.

The methodology for the financial analysis (known as a Proforma) considered the base period's average (1997 – 1999) operating expenses and used those years as the base for comparing the subsequent years (2000 – 2006) operating performance. "Proforma financial statements may project … years into the future. The advantage to the Proforma approach to forecasting is that a much greater degree of flexibility is possible" (Eakins, 2005, p. 422). This method used the historically determined (base period) relationship of operating expenses as a percentage of the units of production, and then applied the percentages against the actual units of production over the periods following the base

period (fiscal years 2000 through 2006) to project the results, assuming no change in the relationship. The Proforma financial statements "describe a statement that is not based on actual data but rather depicts a firm's financials under a given set of hypothetical assumptions" (Berk & DeMarzo, 2007, p. G-13). "These financial statement columns yield Proforma financial statements because they show the statements *as if* the proposed transactions occurred" (Wild, 2005, p. 122).

In the second quantitative phase, a survey instrument was used to collect data regarding behavioral observations and attitudinal measures considered to be crucial to the successful implementation of a organizational cultural change system. The instrument for survey was purchased by the researcher from Human Synergistics, Inc., for the express purpose of conducting this study. Survey data were provided without participant identifiers to Human Synergistics for inclusion in their data base and were used only for purposes of checking the norms, reliability, and validity of the inventories. Hard copies of the questionnaire and a written explanation of the study were distributed to potential subjects through JEA inter-office mail. Confidentiality of the data was maintained by the researcher. All participants in the population were selected to complete the survey. All participants returned the survey to the researcher in a self-addressed envelope. The researcher gathered data after the event of interest (implementation of a performance management system) and used inferential statistics for analysis of existing data that were available as public record. JEA is a public entity whose records are available through a public records request. Organizational documents and materials used are publicly available or published by the organization. No organizational data were used which can not be obtained under Florida's Sunshine Law requirements.

The Survey Questionnaire

The *Organizational Culture Inventory*© and *Organizational Effectiveness Inventory*™ (OCI©/OEI™) is a standardized questionnaire designed to assess organizational culture and attitudes. In the present study it was used to provide information on the impact of Six Sigma as an organizational cultural change system. The survey was developed for use with members of large corporations, small businesses, government agencies, healthcare, and other professional organizations, and not-for-profit organizations, and was appropriate for use with this population. The survey instrument helped provide a detailed picture of the organization's culture, the values and related factors leading to and reinforcing that organizational culture, and the outcomes of the organizational culture.

> Organizational values refer to the principles which underlie patterns of behaviors and norms. A typical questionnaire item would read the degree to which "respect for individuals" or "flexibility," for instance, are characteristics of the firm's organizational culture. Questionnaires designed to assess organizational culture as shared values include the Organizational Culture Profile© [which the researcher has used in this study], the Organizational Culture Index and the Comparative Emphasis Scale. The main advantage of this category of instruments is their commensurate measurement scheme where individual preferences and organizational values are assessed along the same dimensions, enabling estimations of congruency. (Delobbe, Haccoun, & Vandenberghe, 2004, p. 4)

The OCI© is an established instrument that can be useful in evaluating the implementation or evolution of shared governance. The OCI© can be used not only in

research, but also can provide assessment data for organization development and system-wide change (Belcher, 1998).

Methodology of the Qualitative Phase

An interview protocol was used to focus on the implementation of the Six Sigma performance management system in a governmental organization, JEA (a "real world" setting). Interviews were conducted with the principal executives who were instrumental in its implementation, along with analysis of the results since the implementation of the on-going training and performance management. Qualitative research, according to Leedy and Ormrod (2001) includes a variety of approaches to research. They stated that these approaches are different, but that they share common characteristics including a focus on phenomena that occur in natural settings and involve studying those phenomena and their complexity.

An important element of qualitative research is to connect its approaches to underlying philosophical/epistemological perspectives and also attempt to relate these to the traditions of fieldwork in education and to practitioner-posed research questions. Further, qualitative research attempts to explore the major approaches to qualitative research related to educational leadership, and to analyze critically the appropriateness and strengths of its major approaches in reference to various research questions. One facet of qualitative research is to suggest designs for initial research studies in educational leadership that reflect both practitioner concerns and qualitative research approaches; and to link qualitative investigations in educational leadership to related quantitative research, to hypothesis development, to theory development, and to practice (Creswell, 2002).

Eisner (1998) described validity, reliability, and generalization as terms that educational researchers commonly use in discussing the merits of research work. These terms have also been applied to efforts within the qualitative paradigm. Each of these terms is important in establishing the value of the research effort to the audience, and, among these, the researcher believes that validity is the more important.

Differences in organizational culture and attitudes among and between the target study groups in the population were considered through both interviews and a survey instrument. Interviews were conducted through the purposive selection of the executives who were involved in the decisions to implement Six Sigma, and their interview responses constitute a qualitative component in support of, and perhaps differing with, the survey's measures, thus providing an alternative qualitative way of measuring the perceptions and attitudes.

Eisner commented on validity with the following statement:

> I wish to comment upon validity when it comes to matters as complex and subtle as the description, interpretation, and evaluation of teaching and life in classrooms. First, we are not seeking a purchase on reality "as it really is." Second, because we can secure no unmediated grasp of things as they "really are," we cannot ever be certain of having found Truth. Third, the fact that we make judgments does not mean we can have no basis for judging the soundness of the judgments we make. It is reasonable to expect that we have good grounds for the judgments we make, but not that our judgments are certain.… We require only that there be no *reasonable* doubt about the validity of the verdict. We don't say that "anything goes" in qualitative studies. The issue turns on what counts as

evidence. (1998, p. 109)

Eisner described structural corroboration as a "means through which multiple types of data are related to each other to support or contradict the interpretation and evaluation" or "typifications" (1998, p. 110). In other words, the body of evidence presented in the research is compelling in its weight, making it persuasive to the audience and therefore credible in the interpretation. Eisner also discussed consensual validation, by which he meant an evaluation by "competent others [agreeing] that the description, interpretation, evaluation, and thematics of an educational situation are right" (p. 112), meaning that an audience of knowledgeable others who read the research were in agreement that the work was right in its assessment of the research data. Validity, as is logic, is an argument said to be valid if the truth of the conclusion follows from the truth of the premises. *Merriam-Webster Online Dictionary* defined valid as being "well-grounded or justifiable**:** being at once relevant and meaningful" (2005).

The researcher's purpose in conducting interviews in this study was to learn what the interviewees did, what they observed, and how they saw the implementation activity. The researcher is central to the process of doing research. According to Peshkin, "there is no prototype qualitative researchers must follow; no mold we must fit in, to ensure that we are bound for the right track" (1993, p. 28). These interview descriptions illuminate the researcher's work through verbal pictures, and can make qualitative research more meaningful to the audience than just the information of the research.

Qualitative approaches, when used in exploring organizational culture, assess organizational culture along unique dimensions. These dimensions are able to reflect the several views of the organization's members, allowing the qualitative research to present

inner views of the organization (Delobbe, Haccoun, & Vandenberghe, 2004). The performance system under investigation in this study has not been widely used by government entities. As a result, the unique views expressed by the executives regarding this implementation are made more meaningful due to the relatively newness of this activity.

This qualitative approach illuminated and helped to explain the significance of implementing a continuous improvement program in a government enterprise. This will be of interest to a number of organizations which desire to improve their performance and become more efficient. Government units are often very bureaucratic in their management styles, and while this may have worked in previous times, the emergence of highly technical tools, and the sophisticated systems of today are often thwarted by bureaucracy, lessening the improvements that could have been provided by these systems.

As Peshkin stated, "*problem finding* is a type of insight that may result from interpretation. To know what is problematic about a teacher, student, classroom, or school [or an organization] is to have learned something of value" (1993, p. 26). He made a strong case for qualitative research, criticizing the "too-limited conventional focus on a theory-driven, hypothesis testing, generalization-producing perspective" (1993, p. 27). Qualitative research can be useful in illuminating, describing, and adding rich texture to the organization being studied (Peshkin, 1988, 1993), and in that regard, is often described as mixed method research, when coupled with quantitative research.

Research Population

The principal population studied included the appointed staff of JEA, the engineer staff, and the Executive Management Team (EMT). Demographic questions provided five groups: The appointed staff at JEA, which obtained certification as GBs (approximately 200+), the engineers who were certified GBs (approximately 100), engineers who have not had GB training, individuals who have had training as BBs at JEA (approximately 15), and the EMT. The population was located primarily in Duval County, Florida. The researcher asked the EMT officials to permit access to the staff, engineers, and BBs and full access was granted.

Data Collection and Analysis

The data collected were of three types. The first data collected were the financial data for JEA, which are available in the JEA Fiscal Year 2006 Annual Report. The data included the primary operating statistics for the period beginning with fiscal year 1996-1997 through fiscal year 2005-2006. The quantitative data were enhanced by the qualitative component, an interview protocol designed to provide a context for better understanding the statistical findings.

The interviews were conducted with the executives who participated in the initial selection and implementation of Six Sigma at JEA. The participants were not randomly selected, and represented a purposive sample. These interviews were retrospective in nature, as the executives were asked to reflect upon their experiences with Six Sigma implementation over the previous 5-year period. The interview data were obtained from a

small sub-set of 10 executive management members who were directly involved with the initial decision and implementation of Six Sigma at JEA. The interviews were conducted with economy of time considerations and were approximately 45 minutes in duration. Potential subjects were invited by the researcher to voluntarily participate in an interview. Interviews were conducted one-on-one and, with participants' permission, interviews were audio-recorded. Interview subjects were provided an informed consent document. No interviews were conducted without prior receipt of signed informed consent documents. Interviews were conducted at the subjects' JEA offices. Representative interview participants were given a copy of the interview transcripts to review for verification purposes and to facilitate member checking.

The survey questionnaire, the OCI©/OEI™, was distributed to 200 professional and administrative employees, 94 of whom self-selected to respond, for a 47% response rate. The survey participants were provided a written explanation of the study informing them that their participation was voluntary, and they could choose not to participate by not completing the survey, and, at their option, returning the survey unmarked. The survey materials included the following statement: "By completing and returning this survey anonymously in the envelope provided, you are signifying your informed, voluntary consent to participate in this study." All participants in the population were selected to complete the survey. Participants returned the survey in a self-addressed stamped envelope.

Survey Instrument: Validity and Reliability

The OCI© is a statistically normed and validated survey used for organizational consulting and change purposes that was developed by Human Synergistics International.

The OCI is a quantitative instrument that measures 12 sets of behavioral norms associated with three general styles of organizational culture - constructive, passive/defensive, and aggressive/defensive. (Balthazard, Cooke, & Potter, 2006).

> "The OCI contains 96 items designed to produce 12 scales of eight items each. Each item describes a behavior or personal style that might be expected of members of an organization. On a scale of 1 to 5, respondents are asked to indicate the extent to which each behavior is expected or implicitly required (of them and people like themselves) in their organization. The 12 sets of behavioral norms measured by the OCI are graphically represented using a circumplex, a circular diagram on which the distance between behavioral norms reflects their degree of similarity and correlation" (Balthazard, Cooke, & Potter, pp 712-713).

The OEI™ was designed for data-based change programs designed to promote not only employee engagement but organizational effectiveness as well. The OEI™ assesses outcomes at the individual, group, and organizational levels, and internal processes and systems that are causally related to these outcomes. The reliability and validity of the data collected using OEI™ scales were examined with a sample of 6,444 members of 1,080 organizational units that were randomly selected to participate in a project directed by Robert A. Cooke (Szumal, 2001). Participants completed both the OCI© and OEI™ primarily for research purposes. An organizational unit is defined here as a group of people who work under the same manager or supervisor. For most of the organizational units, a sample of four to six members were asked to complete both the OCI© and the OEI™. Inter-rater reliability was tested by conducting a series of one-way analyses of variance (ANOVA) with the organizational unit as the independent variable and the

OEI™ outcomes and causal factors as the dependent variables. The *F* statistics from the ANOVAs were used to determine whether the variance in responses of members from different organizational units was significantly greater than the variance in responses of members from the same unit. Statistically significant *F* statistics provided support for inter-rater consistency and the aggregation of respondents' OEI™ scores to the unit or organizational level. The eta^2 statistics from the ANOVAs were also reported as they provide an estimate of the percentage of variance in respondents' OEI™ scores that is explained by unit membership. "Previous studies based on the OCI© suggest the relationships to be expected between the OCI© and OEI™ measures (e.g., Cooke & Szumal, 1993, 2000; Klein, 1992; Klein, Masi, & Weidner, 1995; Kosmoski-Goepfert, 1994; Szumal, 1998; van der Velde & Class, 1995)" (Szumal, 2001, p. 8).

Data Analysis

The data gathered for the present study included existing publicly published financial data, enhanced by a survey and individual interviews. Data were gathered after the event of interest (implementation of a performance management system) and were analyzed using descriptive statistics, discriminant function analysis, and recursive coding of interview notes and transcripts. Interviews were recorded, transcribed, and analyzed to identify major issues, recurring themes, and any recommendations.

The data provided by the survey instrument were analyzed using descriptive statistics and appropriate inferential techniques to determine whether statistically significant differences existed among and between the employee sub-groups. Analysis of the survey data incorporated the following statistical techniques: a descriptive analysis, followed by statistical significance testing using discriminant analysis among the groups,

which included canonical discriminant functions, then correlation analysis among the groups with regard to specific questionnaire groupings.

The analysis of the survey instrument, described above in the survey phase, also sought to determine if statistically significant differences existed in organizational culture perceptions and attitudes among and between the target study groups in the population as measured by the survey questionnaire. Additionally, interviews were conducted with the purposive selection of the executives who were involved in the decisions to implement Six Sigma, and their interview responses constitute a qualitative component subset in support of and perhaps differing with the survey's measures while providing an alternative qualitative way of measuring the perceptions and attitudes.

Ethical Considerations

The researcher received permission to conduct the research at JEA, and the research design and protocol for data collection were approved prior to the commencement of the study by the University of North Florida Institutional Review Board for the Protections of Human Subjects (Appendix I). The following safeguards were employed to protect interview and survey participants.

In phase I (surveys), the identities of survey respondents were not collected so responses were anonymous. All potential participants received a written explanation of the study that included the following statement: "By completing and returning this survey anonymously in the envelope provided, you are signifying your informed, voluntary consent to participate in this study."

In phase II (interviews), all individuals interviewed were personally provided the informed consent form and an abstract of the study by the researcher, and only those

individuals who signed the informed consent were interviewed. Each interviewee's name was encoded with a pseudonym to protect his or her identity. All participants were given a research consent form to review and sign prior to the interview. Participants were given the option of having their interview audio-recorded. A list of the interview questions is attached in Appendix II. No children or individuals under 18 years of age were involved in the study.

Researcher Point of View

At the time of data collection, I was an appointed staff member at JEA, and was responsible for the long term financing of capital construction funding for JEA. I received Six Sigma GB training at JEA and I am a certified GB. I am also a certified public accountant with significant expertise in financial analysis and research. As a certified GB, I have successfully used the tools of Six Sigma in a GB project, and continue to use the statistical measurement tools in work related activities. Bias toward the performance management system is a function of determining its usefulness, and in that regard, I believe that this system is certainly one of several such systems that have proven their applicability and usefulness.

As with any study, researcher bias was present to some extent because of my previous experience and involvement with the subject matter and the organization. Maximum effort was made to minimize any bias by providing the entire population the survey instrument, and by restricting interview participants to a small group of managers who were involved in the initial selection and implementation decisions of Six Sigma to provide qualitative descriptive background for the study.

Limitations of the Study

This study sought to provide inferential analysis useful in evaluating performance management initiatives in a government enterprise. The specific conclusions drawn from the analyses are most immediately relevant to the study population. However, the findings of this study may be of interest to other organizations and government entities engaged in or considering implementation of a performance management system such as Six Sigma.

The inferential analysis portion of the study provides information useful in evaluating performance management initiatives in a governmental enterprise. The specific conclusions that may be drawn from the analyses are most immediately relevant to the population of the study. However, the findings of this study may be of interest to other organizations and government entities that are engaged in or considering implementation of a performance management system such as Six Sigma.

Chapter Summary

The present study examined the implementation of a performance management system in a large government enterprise by investigating both the financial and organizational culture impacts of the implementation. This chapter provided a detailed description of the research questions, design of the study, research population, data collection and analysis, and limitations of this work.

A mixed method design was employed in this study. Mixed method research combining quantitative and qualitative research is one form of triangulation. The research questions were analyzed in the following ways. First, question 1 was analyzed through a Proforma financial protocol using traditional financial metrics and JEA's publicly

disclosed financial statements and schedules. A statistical analysis of the Proforma results was performed.

Question 2 was addressed in two ways. First, qualitative interviews were conducted and second, the quantitative research with the OCI©/OEI™ survey instrument was analyzed. The interviews were designed to focus on the implementation of the Six Sigma performance management system in a governmental organization, JEA. The analysis of the survey instrument sought to determine if statistically significant differences existed in organizational culture and the perceptions and attitudes among and between the target study groups in the population.

CHAPTER 4

DATA ANALYSIS

Analyses of the data and the findings related to each research question are provided in this chapter. By investigating the performance management system's (Six Sigma's) implementation effects and outputs, through the discriminant function analysis of the survey instrument results, the examination of the interviews conducted, and development of major themes, the results among the groups being examined may be useful for future research studies.

Research Question 1: Analysis and Discussion

Question 1: What is the cost/benefit to JEA of implementing Six Sigma?

This research question used the published financial information for JEA from 1997 through 2006. An analysis was conducted to determine whether there was a tangible financial benefit discernible from the historical data. This study analyzed the audited financial statements of JEA, using as a baseline the average for fiscal years 1997, 1998, and 1999, and compared the actual operating and maintenance expenses separately for the electric system and the water and sewer system. Assuming the cost of capital (at JEA, this is considered to be the interest rate for fixed rate bonds) for an organization, the analysis explored whether Six Sigma's implementation in an organization improved its productivity and efficiency, and whether improvements were apparent in other financial measurement metrics, such as a reduction in the operating and maintenance expenses per

unit of production or increased return on assets employed, or whether it actually resulted in the use of more resources than it provided as cost avoidance and savings. The metrics for this phase of the study examined the operating results for those years just before the introduction of Six Sigma and compared those operating data over subsequent years through the recently published results for fiscal year 2006.

An analysis was performed using the financial data shown in Appendix III, which also contains the results of the examination analysis details summarized below. The potential Proforma results were first examined using the base period for fiscal years 1997-1999 against the actual results for each of the succeeding years from fiscal year 2000 through fiscal year 2006. The base period's actual operating and maintenance expenses for each of the 3 years was averaged and taken as a percentage of the actual units of sale for each of the two operating systems being examined. In the case of the electric system, the megawatt hours sold (MWh) in each fiscal period were used. For the water and sewer system, the combined CCFs (hundreds of cubic feet) of water sold and sewer treatment were used. Based on this analysis, the aggregate savings for the period under investigation were projected to be $84,928,000, allocated between the electric system at $10,275,000 and the water and sewer system at $74,653,000.

The results were then tested with the following analysis in Minitab: For the Electric System, the aggregate Proforma Operating and Maintenance (O&M) Expenses (1200898) divided by the MWhs Sold (a) during the period of FY2000-FY2006 versus Electric System Actual O&M Expenses (1190623) divided by the MWhs Sold FY2000-FY2006 were compared and are presented in Table 2.

Table 2.

Minitab Test and CI for Two Proportions – Electric System

Sample	X	N	Sample p
1	1200898	X 90275817 (a)	= 0.013303 Proforma O&M Expenses / Total MWh Sold
2	1190623	X 90275817 (a)	= 0.013189 Actual O&M Expenses / Total MWh Sold

Difference = p (1) – p (2) Estimate for difference: 0.000113818
95% CI for difference: (0.0000804661, 0.000147170)
Test for difference = 0 (vs. not = 0): Z = 6.69, P-Value = 0.000

There is a statistically significant savings

For the Water & Sewer System the aggregate Proforma Operating and Maintenance (O&M) Expenses (596805) divided by the CCFs Sold (b) during the period of FY2001-FY2006 (O&M/CCF) versus Water & Sewer System Actual O&M divided by the CCFs Sold during the period of FY2001-FY2006 were compared and are presented in Table 3.

Table 3.

Minitab Test and CI for Two Proportions – Water and Sewer System

Sample	X	N	Sample p
1	(b) 596805	X 531121649 (b)	= 0.001124 Proforma O&M Expenses / Total CCFs Sold
2	(b) 522152	X 531121649 (b)	= 0.000983 Actual O&M Expenses / Total CCFs Sold

Difference = p (1) – p (2) Estimate for difference: 0.000140557
95% CI for difference: (0.000136656, 0.000144459)
Test for difference = 0 (vs. not = 0): Z = 70.61, P-Value = 0.000

There is a statistically significant savings

The Minitab Test of Two Proportions, as used in this analysis, was taken from the software system used at JEA for the GB and BB projects. By default, the null hypothesis for this test is the H_0: p1 = p2, or that there is no statistical significance. The alternative hypothesis reflects what is being tested. In this case, H_a: p1< p2, or H_a: p1 > p2, there is a statistically significant difference, which is illustrated by the Z = 70.71 or (p< .001). The *Z-scores* are a means of answering the question of how many standard deviations the

observation is from the mean. By empirical rule, if data follow a bell-shaped curve, then approximately 95% of the data should have the *Z-score* between -2 and 2, so with a Z-score of greater than 70, the statistically significant conclusion is supported at the 0.05 level of confidence. The detailed data examination and analysis are reviewed and illustrated in the Table 4.

Table 4.

Analysis of Operating and Maintenance Expenses

Analysis of Potential Savings Fiscal Years 2000-2006: ($ Millions)								
Proforma Operating Expenses, Based on the % for FY 1997-1999 as the Base for Calculations:	FY06 Units* Base	FY05 Units* Base	FY04 Units* Base	FY03 Units* Base	FY02 Units* Base	FY01 Units* Base	FY00 Units* Base	FY99-96 Average
Electric System Megawatt Hours Sold (000)	16,684	16,238	15,953	16,117	15,212	15,222	14,576	
Electric System Megawatt Hours Sold (000) (a) *	14,035	13,660	13,296	13,205	12,228	12,216	11,636	
Proforma Electric System Operating and Maintenance Expenses (a)	186.7	181.7	176.9	175.7	162.7	162.5	154.8	
Actual Electric System Operating and Maintenance Expenses (a)	194.5	176.6	174.5	186.0	168.6	141.5	149.0	1.330%
Actual Savings Versus Proforma Operating and Maintenance Expenses	(7.658)	5.098	2.403	(10.347)	(5.919)	20.972	5.727	
Water & Sewer System Water CCFs (000)	55,732	49,711	50,256	45,113	43,440	38,130	39,239	
Water & Sewer System Sewer CCFs (000)	35,762	33,346	33,038	30,381	27,912	24,640	24,422	
Total Water & Sewer System Sewer CCFs (000) (b)	91,494	83,057	83,295	75,494	71,352	62,769	63,661	
Proforma Water and Sewer System Operating and Maintenance Expenses 1 (b)	102.8	93.3	93.6	84.8	80.2	70.5	71.5	
Actual Water and Sewer System Operating and Maintenance Expenses 2 (b)	87.9	80.7	79.5	69.0	72.6	65.3	67.1	0.112%
Actual Savings Versus Proforma Operating and Maintenance Expenses	14.883	12.668	14.090	15.784	7.560	5.203	4.465	
Actual Savings versus Proforma – Annual	7.225	17.766	16.492	5.437	1.641	26.175	10.192	
Aggregate Actual Savings Versus Proforma	$84.928							

* Excludes FPL saleback

Based on the analysis, and in comparison with the original data previously discussed in chapter 1, Table 1 (below repeated from Chapter 1), indicated TargetSmart savings of $147,648,072. It can be stated that the data analysis as outlined above showed a statistically significant difference between the Proforma savings and the actual operating and maintenance expenses implying that the TargetSmart program implemented at JEA was correlated with operating cost savings during the period under examination.

Table 1.

TargetSmart Program Results

JEA - TargetSmart Initiative Costs	Unit Cost	Quantity	Total Cost
Initial exploration team costs	$400,000	1	$400,000
1 wave Black Belts (BB) and 3 waves of Green Belt (GB) training costs - Qualtec Contract	1,200,000	1	1,200,000
BB personnel costs for entire program	7,000,000	1	7,000,000
GB personnel costs for entire program	5,000	400	2,000,000
Typical BB project costs (team participation)	5,000	128	640,000
Typical GB project costs (team participation)	3,000	260	780,000
MSI first contract	970,000	1	970,000
Total	$ 9,583,000	792	$12,990,000
JEA - TargetSmart Initiative Results	Expected Benefit		Actual Savings
Typical BB cost: 43 over $100,000 projects	$56,453,715		$56,453,715
Typical GB cost: 53 over $100,000 projects	31,499,555		29,176,084
Impact of projects with < $100,000 savings	N/A		$62,018,273
	$87,953,270		$147,648,072
Return on investment	677%		1137%
Annual rate of return	123%		207%
Internal rate of return, assuming = savings in each period over 6 years	110%		188%

Source: JEA

Shown graphically, the analyses illustrated the difference between the historical base years operating and maintenance expenses and the Proforma operating and maintenance expenses. This is given first for the electric system in Figure 3.

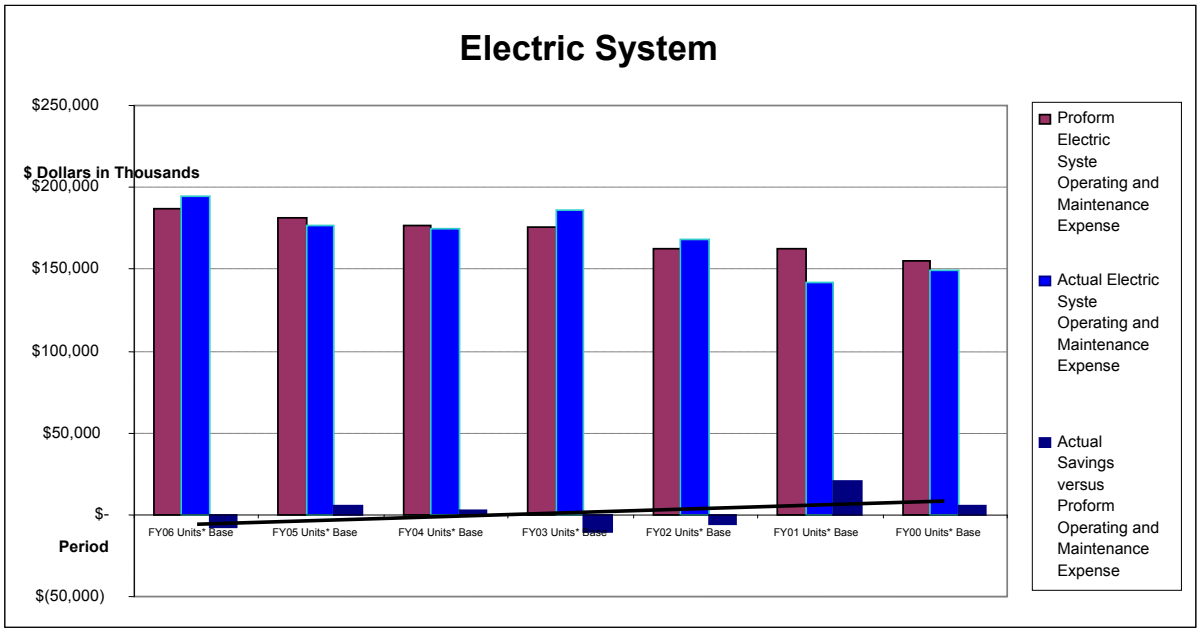


Figure 3. The electric system analysis of Proforma savings.

Figure 4 presents the graphical representation of the water and sewer system analysis.

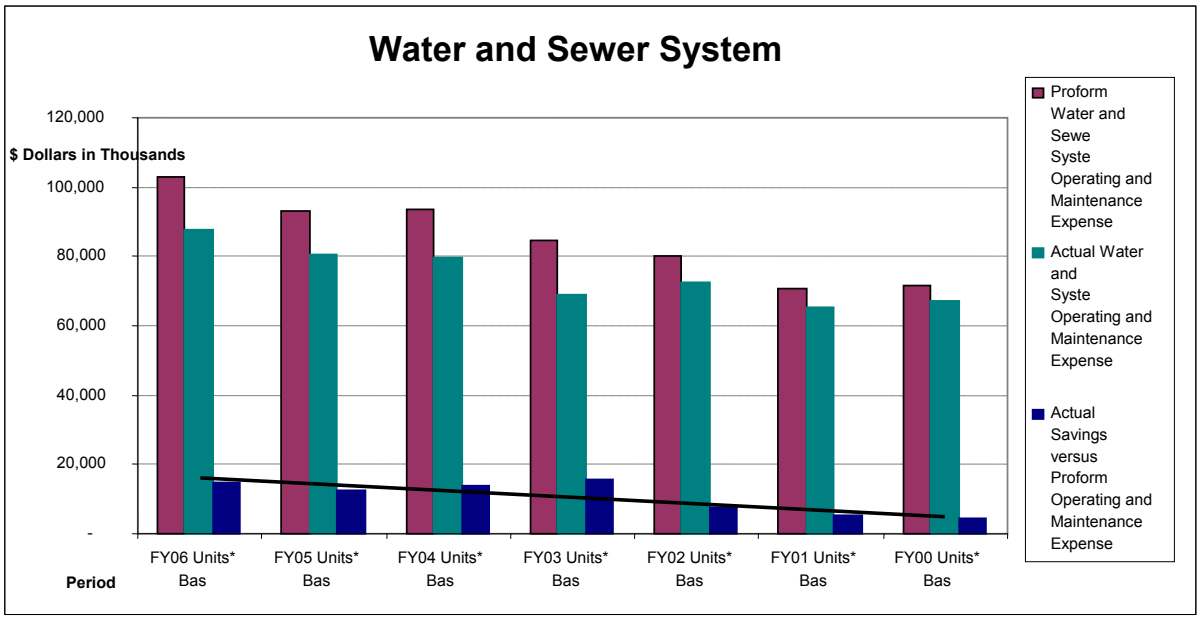


Figure 4. The water and sewer system analysis of Proforma savings.

Research Question 2: Analysis and Discussion

Question 2: Is there a significant difference in organizational culture and attitudes among and between the population's employee groups according to differing degrees of Six Sigma training and levels of prior statistical education?

Differences in organizational culture and attitudes among and between the target study groups in the population were considered through both semi-structured interviews and a survey instrument. Interviews were conducted with the purposive selection of the executives who were involved in the decisions to implement Six Sigma. Their interview responses provided a context for better understanding both the financial analyses conducted to address the first research question, and the results of the OCI©/OEI™ administration, which addressed the second research question. This qualitative technique served to clarify and enhance understanding of the inferential and descriptive statistics, thus strengthening subsequent conclusions and recommendations.

Interviews: Major Issues, Recurring Themes, and Recommendations

The interviews were conducted by the researcher in the offices of the 10 selected members of executive management who were instrumental in the implementation of Six Sigma at JEA during the period of fiscal year 2000 through fiscal year 2006. The questions, Appendix 1, that were asked were provided to the Institutional Review Board following a review by the interviewer with his committee chair, and others. The questions were also reviewed with specialists in questionnaire design for content and specificity with regard to the study's objectives. In structured interviews (also called standardized interviews), the interview format used in this study, researchers ask the same set of questions, in the same order, using the same words, to different interviewees.

Structured interviews are convenient for comparing different interviewees' answers to the same questions, and when a team of researchers is involved in conducting the interviews (Creswell, 2002).

Analysis of interviews

The interviews with the executives took place over a period of approximately four months and were conducted in the respective offices of the executives. The interviews were semi-structured. In qualitative research, researchers "attempt to understand meanings that people give to their deeds or to social phenomena" (Oka & Shaw, 2000, p 115). In the present study, I collected quantitative data and, through interviews with selected participants, qualitative data. The interviews were used to add a rich, descriptive background. Wolcott (2003) described this as a variation of the case study method in which "the role of participant and the role of observer are essentially complementary and mutually exclusive; the more perfectly you activate one, the less perfectly you activate its reciprocal" (Wolcott, 2003, p. 7). The data that follow include several main themes and related sub-themes that emerged during the interviews. The first major category to emerge was the early implementation activities.

Participant comments on early implementation. One early participant in the implementation, an executive referred to as Pathfinder, was part of a group known as the corporate strategy team (CST). As Pathfinder described it,

> The CST was an internal group which included several directors. In the late 1990s, the CST looked at the organizational development role in the organization. The key driver was a former CEO who brought the idea of Six Sigma to JEA as a

performance management system. The implementation was top down driven, and the CST did a best practices research in order to recommend a program for JEA. Pathfinder served as a co-implementation agent and a co-facilitator. He said, "the CEO had several meetings with the EMT on what Six Sigma was, and on how to implement it and a number of different perspectives about Six Sigma were discussed." Pathfinder described the implementation's beginning with "a soft launch during fiscal year 1999-2000, then with the 2001 reorganization there was a parallel launch company wide," which Pathfinder says was not really on purpose, but was coincidental. According to Pathfinder, "the CST felt the two [implementation of Six Sigma and the reorganization] would reinforce each other, as the reorganization was around processes and reengineering, while Six Sigma provided an addition to the group of drivers for the reorganization."

Another executive known as Big Bear also had an early role in the assessment of Six Sigma as a performance management system. Big Bear concurred with Pathfinder's recollection that the former CEO has brought the idea of Six Sigma to JEA, but said.

> I didn't feel sure that the CEO considered whether it was really a performance management system, but I felt that the CEO was looking for something that would, make JEA perform better and so he brought Six Sigma to the EMT. … The CEO had several meetings with the EMT on what Six Sigma meant, how to implement it and different perspectives about the program were discussed. There were a number of VPs in the organization at the time, and I think there were eight VPs, and I had the biggest area, operation and maintenance.

One of JEA's previous programs was WorkSmart, a reengineering program. Big Bear said, "I picked out the name TargetSmart for JEA's implementation of Six Sigma since it is focused on process improvement, and uses goals and objectives for the projects."

Southside Sioux, an executive who was involved in the implementation, albeit at a later date, recalled that JEA had employed a number of other different systems over the years prior to the implementation of Six Sigma. Southside Sioux felt that as "Six Sigma was most effective in heavily manufacturing applications, that by driving it down to the organization it is more difficult to measure effectiveness." In discussing the reasoning behind Six Sigma, Southside Sioux observed that

> At the time of the implementation of Six Sigma, JEA was still in the process of integrating the recently acquired [mid-1997] water and sewer system with the electric system operations and it was hoped that a unifying system such as Six Sigma would bring these two different organizational cultures together.

Builder, another executive, said the following of the early decisions around choosing Six Sigma,

> The CST and two consulting firms at the time were instrumental in the selection of Six Sigma. They had close associations with the CEO. … I believed that 20% of the decisions came from the consultants and 80% from the CST. Six Sigma was one component of change management systems and it was the GE model that was implemented. Organize for processes and flatten the organization by reducing the number of reporting levels from say 10 to 5. … This was a private sector program and included implementing private sector compensation plans and business process reviews. Most of the EMT supported the program and the

> directive from the CEO was "to get on board" or leave the organization. The Six Sigma implementation was pretty much in a box, and the EMT spent time on organizational design and selection of the consultants to implement it.
>
> Six Sigma Qualtec and MSI were selected as consulting firms to help JEA in the implementation.

Osceola observed,

> The EMT members participated in the decision to implement Six Sigma prior to the 2001 reorganization. The managing director was the most instrumental in making the decision supported by work of the CST. They had investigated Six Sigma and had visited Motorola to learn about it. They probably also looked at Lean Six Sigma but felt that the Six Sigma program was more rigorous. The expectations were not quantified. Six Sigma could be implemented over the entire organization to improve all processes, operational, financial, customer service, etc. Six Sigma was expected to have a direct impact on the organization, not across the entire entity equally, as it depended on implementation and the nature of the processes. It was designed to improve productivity.

Laura, who had joined JEA somewhat after the TargetSmart implementation said,

> [I] felt that there was misunderstanding around it. There was not much organization around it at the time. … I had joined JEA from another organization which had used it as more of a quality management program where it was aligned with the strategic plan. [My] expectations for Six Sigma were based on background knowledge of its use elsewhere.

Valkyrie, another executive, said,

> Six Sigma was integrated in the reorganization in 2001 and the first wave had an initial BB group of 10. The initial implementation was lacking, and was driven by outside consultants. There was an inadequate process to select a project; here's the order, pick on but no reasoning as to why [or] what we were driving for. The reasons why included that there were no decision trees, and no clarity about what we were looking to get out of the tools. The theme had mixed results, depending on where we applied the tools. Initially we implemented Six Sigma everywhere, with process mapping and metrics, everybody was to measure cycle time and some areas got it right and some didn't.

Theme 1: Expectations. The first general theme that resonated among the executives was that the implementation of Six Sigma was expected to provide improvement in operating results and also to bring a organizational cultural standard for quality and operations measurements. In describing the effects of implementing Six Sigma, several of the executives indicated some variations in levels of success achieved.

Big Bear, in charge of the biggest area at the time, involving all of the processes under the areas of operation and maintenance for both the electric system and the water and sewer system, said that Six Sigma incorporated statistics which were already being utilized in the operation and maintenance areas and that Six Sigma was more applicable to some areas of the organization (like his own) than to others (such as finance). Big Bear remarked,

> My expectations of Six Sigma were that JEA would apply it consistently to all parts of JEA, and that the expectations were that outstanding results were to be

> achieved for all areas and that with every program you introduce you always have high expectations.

In regard to the meeting of those expectations, he said,

> The statistics provided since we implemented it are more readily applied and required to some areas of the organization than to other areas of the organization. … For my part I think there are negative and positive effects; on one side folks that have functional behavior because of fear of what would happen to them, but results were focused on a step by step implementation. … Of course if you get contradictions from different EMT members about Six Sigma's meaning and value to JEA it is because of the different perspectives about Six Sigma that they hold. For example, one of my directions to my managers is to use it.

Pathfinder said,

> We wanted to involve Six Sigma in [JEA's] corporate philosophy. It depends a bit more on charisma, in a merged sense, we are adding Lean to our Six Sigma program this year. Performance management is slightly different, and is where you basically identify things which are important to measure at the end of the year, set a benchmark value, measure, provide feed back and then at the end of the year do the evaluations, etc.

Osceola reflected that "Six Sigma was expected to have a direct impact on the organization, not across the entire entity equally, as it depended on implementation and the nature of the processes. It was designed to improve productivity." Southside Sioux's description of the original expectations of the Six Sigma implementation was that "it was hoped that it would improve customer satisfaction and drive down costs of operations."

But she felt that as "Six Sigma was most effective in heavily manufacturing applications, that by driving it down to the organization it is more difficult to measure effectiveness." Builder said,

> [My] expectations were that for the organization to be the best, you needed to be run by the numbers. JEA was to be more like the private sector model, and the desire was to get ready for deregulation, which was then a concern. JEA needed to be able to compete with the investor owned utilities.

Aphrodite said,

> Six Sigma is a tool kit for investigation of processes and measuring metrics. It was an integral part of measuring a manager's ability to understand the processes and to get results and to use a number of individual metrics to measure a manager's ability to get results. There were several years of "galvanizing" events to change the organizational culture of JEA to be data driven. The expectations were that the company would move to being data driven and use key indicators for process management, with a focus on those with performance gaps. The focus would include the overall company objectives to help insure the organization's success and to try to align the organization's business units and staff around common goals and objectives.

Southside Sioux, among others, indicated that an underlying expectation had been that Six Sigma could be applied equally across the organization. "Six Sigma has improved productivity in some areas which are data rich, but when JEA implemented in it a one size fits all format, it was not as effective since one size does not fit all."

Bull commented on this as well, stating,

> [My unit had] experienced a net loss of productivity when implementing Six Sigma, due to the uniqueness of the unit's activities – marketing, market research, rates, etc. This unit tended to be a strategic corporate planning area with no or little repetitive nature to its activities. It was not a process based unit, so the implementation mapping activities resulted in a certain amount of "force fitting" of the metrics into the mapping and measuring process of implementing this program, but the mapping was OK, the difficulties were in the metrics. In areas with lots of data related to processes, it works well, but in areas with little, not so well.

Builder said that the "MD directed modeling of the units, and spent time challenging the resistance to running the organization by the numbers. The new focus was on being data driven. The general observation was that it was a positive change." However, he said that Six Sigma was implemented in a punitive style – one size fits all – and he had the impression that it created a "bad taste." Valkyrie offered clarification for this observation,

> The areas with data, such as the power plants and manufacturing type activities did understand it. Other areas could have, but the mind set of the process owners was an impediment. Cultural piece that the process owners had was that to uncover a problem was bad. Improvements in productivity were mixed.

Theme 2: Organizational culture change management effects. Another theme several executives described was the change management effects of implementing Six Sigma throughout the company. For example, as referenced in an earlier comment where Valkyrie discussed attending a recent meeting and noted that employees from different

areas of the company shared "a common language, and understood a common set of tools." This shared language and tools enabled employees to better focus on areas of concern. Valkyrie offered an example: "One of the plant managers is now undertaking BB training, and championing a project. He called on the MBB to help solve a problem, and used this project to support that it helped solve problems with the tools. This view was also supported by Pathfinder's observations,

> [What is] different now is that we view the organization as processes, and output as products and services delivered, not just activities. Now JEA is more customer oriented, and uses the VOC principles from TQM and Six Sigma to make sure we are using the data to make decisions. Now there is less human element [tribal knowledge] and the focus is on the process not the people involved. It's been hard to get people to accept process error, as people tend to be more about processes now and focused on the data and facts, not on feelings or emotions.

Answers to an interview question regarding the differences in the organization and business units since Six Sigma's introduction also fell into the fourth theme. Big Bear responded,

> I think we decided that there are some parts of the business where Six Sigma isn't as applicable as other areas, but camaraderie focus by groups can be both benefited, or suffer, some areas because of difficulties in applying it that it isn't useful. In those areas, the camaraderie was negatively affected, but in areas where it more readily applies, where individuals can see the value, then it became more useful, these were often areas where engineering, accounting, data, numbers areas where statistics can more readily be applied. Actually, even neural networks can

> be a part of a Six Sigma program. … Every organization has periods of variations, at JEA, every 3 or 4 years we do a reorganization, which can stop programs, delay programs, and the new CEO stated that he would cause a Six Sigma stand down, but Big Bear said that there hasn't been a focused top down Six Sigma effort under the present CEO, and that might be good, since early every one had had to implement it, but now the CEO sees that not every area needs Six Sigma. So certain areas see the value, [and] other areas use it routinely but may not be making as much progress and some areas have dropped it. I think that we will continue to use Six Sigma in the future in the areas where the value has clearly been seen.

Mac confirmed, stating,

> There is more focus on measurement of activities and productivity; also, an improved focus on improving performance. It has both helped and hindered. There was improvement from the process mapping, increased focus on individual teams and on accountability. There has been improvement in individual performance. … There has now been a pause in its use. The early and aggressive implementation has pulled back. Six Sigma's implementation now needs to be reconstituted for a second launch with a focus on strategic units, with projects selectively picked and driven by the EMT; in other words, more like a rifle shot rather than a shot gun.

> Aphrodite made the following observations:

> Accountability has increased, and in order to meet performance levels, shared metrics have been the hardest to achieve, as the biggest focus has been on metrics

> goals. Six Sigma focused first on processes. Once a group buys into Six Sigma, the team work that is involved, etc., they become very positive in its application. … The biggest [change] has been on the way people work. [There is] better interaction now between the operations and maintenance areas of the company and with the environmental compliance group for example. Accountability is improved and the ability to share in meeting the environmental goals while meeting the productivity goals is improved.

Responding to the question about observed changes in the ways that others worked, Builder said,

> There is more discipline in following the DMAIC process and more rigorous evaluation of projects to be undertaken now. The awards committee is better now and the process of approving projects is improved. … The management recovery program in project management is better now. The main indicators of costs and scheduling are better, get projects done on time and on budget is a goal setting activity and measuring is improved.…. Most people are now using Six Sigma tools and have modified them to fit their areas. Measuring is now focused on the most important areas.

Builder's own unit now uses BBs to look at special needs, which he said "helps to adequately define the problems, consider the results wanted and to assess the current state of performance."

Valkyrie made the following comments:

> People are only measured on things they could change, but there are white spaces [gaps] that no one managed and friction has evolved. The end results weren't

coming through. This created some negative perceptions. Another piece of the observation is that it created the same language across the company, same type of data analysis, including why, costs analysis, impacts, etc. were all being looked at before decisions were made, and now with Six Sigma the right questions are being asked.

During another part of the conversation, he said,

> With the present MD, the focus is on specific goals which are important to the organization, and then the efforts are driven from the top down through the chain of command. People now work on projects that are important to them. Where we're going next with process improvement is to continue to link it to the corporate strategy. The missing piece is that with tighter budgets, Six Sigma is a natural fit with performance management and understanding service levels in an area. Customers expect electricity to be restored quickly after a storm, work force management tools now consider how many people we have available, and outsourcing, including engineering needs are used. Improvements in productivity are the key, not adding bodies. Work smarter and do things with fewer people. We will continue to work on integrating performance management analysis of service levels, FTEs needed, and only add people where productivity gains require them.

In answer to the question regarding each unit's current Six Sigma status, Pathfinder said,

> My unit's group leaders, the five I mentioned earlier, don't all use Six Sigma the same way. One does a great job of using Six Sigma, another not much, and three

> are sort of in the middle and continued to use Six Sigma, and identify the gaps, etc. Some do the minimum to get by, and two of my directors do a pretty good job, and they had a lot on their plate the first few months on the job, and the others will use it more.

Osceola remarked,

> The present status is that Six Sigma is now more focused on target projects with high value. The company continues to expect that all managers will focus on process improvement and the tools they can use. Leaders are asked, how have you implemented process improvement in your areas? Finally, more BBs in the organization, and they will continue to look for significant costs and process improvements in the company and across unit lines.

Subtheme: Organizational culture change. Aphrodite described the organizational culture change in these statements:

> The expectations were that the company would move to being data driven and use key indicators for process management, with a focus on those with performance gaps. The implementation of Six Sigma has changed the organizational culture. JEA used to "run on the fly" and was not accustomed to using metrics to measure performance. Now the company has shifted to focusing on the data. It did change the organizational culture to one which now measures things. The environment is one which now leverages Six Sigma projects with matrix based operations and which ensures compliance. JEA has definitely seen the results from Six Sigma.

Pathfinder said,

Six Sigma works, and the organization has been getting the benefits from it, both to the inputs where Six Sigma helps identify those things that need correcting, but it is also transaction oriented and it clearly applies to many of the areas where we are using it in my unit, and I believe that there are more areas where it applies and can be successfully utilized. When we implemented it, we pushed it across the entire organization, and then we noted that there were some areas where it did not look like it was a fit. It was a huge organizational culture shift, and we had a lot of resistance. We put it in 100% of the organization so that we could get a high level of acceptance, although the resistance resulted in a lot of additional effort to overcome. Six Sigma works where you put in the effort to successfully implement it. The electric system's power plant folks are using it now, and we're seeing good results. The organizational culture shift is going on, and with the focus on the data, we will continue to see improving results of the Six Sigma process improvements program. … I am a believer in Six Sigma, and an advocate of it, and some 20 to 30% of JEA managers continued to employ Six Sigma. TargetSmart is just one of the tools we can use, and integrate it with the scoreboard, the Lean principles, and look it terms of who the customers are, and make the decision to track the metrics that are relevant data perspectives.

Osceola reflected,

The organizational culture has clearly changed. Before the MD would say reduce overtime and staff would look how to do that, but the results would be to sub optimize instead of improve the process. Business reviews are very important now as is the use of a common language and more processes are measured now as

> a whole. … There is much better communication now … JEA managers are encouraged to list the risks they see and are willing to disclose them.

Builder also described the current perception of performance improvement in his business unit: "Most people are now using Six Sigma tools and have modified them to fit their areas so that process measuring is now focused on the most important areas."

According to Valkyrie,

> There are two schools of thought. One is that Six Sigma is great, and good; from other people and projects, there is some lingering baggage from poorly executed projects. As a government owned utility, JEA has a non-profit culture, and had historically used subjective evaluation measures versus data driven performance evaluation. One advantage of Six Sigma is when areas experience success, the BBs get invited back to work on other problems.

Big Bear was not so sure a organizational culture change had occurred yet.

> We had an organizational culture before Six Sigma. Do we have a culture with Six Sigma in it? It is certainly a part of what we talk about. Someday I hope we can say we do have a Six Sigma organizational culture, but we don't yet.

Subtheme: A common language. Valkyrie offered an example in the form of a recently attended meeting that illustrated the organizational culture change of 5 years of TargetSmart. He said, "There were five different teams from various areas of the company who were all able to share a common language, and understood a common set of tools, so they were better able to focus on the areas of concern." Laura remarked,

> [It is] important to understand Six Sigma as a common language, so the training is very important. Perception is that the GB training and the BB projects were

> helpful, and that the processes were done well. … Using DMAIC tools for problem solving is continuing, and also using shared language is useful to bring together as a team.

Osceola affirmed the value of a common language, saying,

> All appointed staff are now GBs, so that everyone shares the same set of tools, language, etc. There is much better communication now, and managers not only don't try to hide problems, they have a tool and a system to improve and solve process problems. Enterprise risk management across the organization has benefited from the shared language. Now JEA managers are encouraged to list their risks they see and are willing to disclose them. In the past, there was less information sharing, now much more open and a higher willingness to ask for help.

In another conversation, he said,

> Through Six Sigma process improvement implementation, JEA also has attained a common language among the business managers. This is seen in business reviews, and how process improvement is achieved and reported. Business reviews are relatively new to JEA and had not been used in the past.

Bull described a similar result, stating that requiring that every manager be trained to some level of proficiency in Six Sigma had been a good objective, as "managers then train could train employees and through utilizing the Six Sigma language; it adds uniformity." He also described the BBs as a resource for training GBs, YBs, and others, thus enabling GBs and YBs "to go out and find projects which needed improvements and do the statistical analyses." This, in turn, freed the BBs, allowing them

to be "available to go out to work with areas that need help in solving problems, work with staff of the units, and analyze problems." During another part of the conversation, Valkyrie said,

> [Six Sigma] created the same language across the company, same type of data analysis, including why, costs analysis, impacts, etc. were all being looked at before decisions were made, and now with Six Sigma the right questions are being asked.

Theme 3: Data driven decisions. A recurring theme in the executives' comments had to do with data driven decisions. Osceola stated, "After Six Sigma, the company is much more data driven. Now managers need data to make and support decisions versus just tribal knowledge."

Southside Sioux, however, cautioned against overusing measurement as a tool:

> Now, we can clearly see improvement in measuring activities. JEA had driven its implementation, and was too hasty in trying to see benefits. People should have been able to get a much better understanding of what can be measured, and what should be measured; quality, effectiveness, process improvement, timeliness. Six Sigma has improved productivity in some areas which are data rich, but when JEA implemented in it a "one size fits all" format, it was not as effective since one size does not fit all. … Six Sigma, if properly deployed, can be of enormous benefit to a data driven organizational area. Setting it up organization-wide set back the benefits.

Valkyrie stated,

> Six Sigma will continue as a set of tools for JEA as it continues to move toward data driven process improvements. The introduction of Six Sigma will be continued into other areas through introducing a number of its tools into them through "soft" Six Sigma, brainstorming, etc. It will be used where appropriate and Lean will be useful for some areas where it will provide pull for projects. Process improvement is here to stay!

Pathfinder remarked,

> I like it OK where you have data rationality "in God we trust, all others show me the data" types of activities and processes. … Six Sigma doesn't have to be a 6 month process. Through the integration with Lean principles, we can get quicker review and analyses, so that now we can more quickly realize savings, and process improvements. … Now JEA is more customer oriented, and uses the VOC principles from TQM and Six Sigma to make sure we are using the data to make decisions. Now there is less human element [tribal knowledge] and the focus is on the process not the people involved. It's been hard to get people to accept process error, as people tend to be more about processes now and focused on the data and facts, not on feelings or emotions.
>
> Aphrodite said,
>
> JEA used to "run on the fly" and was not accustomed to using metrics to measure performance. Now the company has shifted to focusing on the data. It did change the organizational culture to one which now measures things.
>
> Bull said,

> Process mapping will continue, with regular reviews and certain metrics, where appropriate, will be measured and collected. Data from areas where good data exist, load research for example, quantify work loads, addressing how much to use load researching facility of network meter reading system, etc. I also like the DMAIC process, quantify capacities of the organization's systems, cost benefit analysis of increase in capacity, etc.

Builder said that he "likes running the unit by the numbers; everyone understands how it works, and it has aided the management of the area." Regarding his own area, Builder remarked that "metrics are the area which this unit is doing the most. Measuring and using the DMAIC process, comparing results with objectives and using the tools to improve the processes." At the time Six Sigma was implemented, Builder said that the "MD directed modeling of the units, and spent time challenging the resistance to running the organization by the numbers. The new focus was on being data driven. The general observation was that it was a positive change." Laura observed,

> Overall the organization is changing, and using Six Sigma as a pilot for the management system is useful. Performance management tools are helpful in tracking the system activities. … [It] is a great tool for the organization and in parts where data are available it clearly has resulted in improved cycle times, reducing costs and improving efficiencies. It helps in establishing accountability.

Aphrodite summed it up, stating, "Six Sigma is helpful in data driven areas where metrics are more relevant."

Subtheme: Process mapping is a good tool. Comments applied to this theme drew primarily from interview questions regarding performance driven

improvement initiatives, goal setting, and objectives. Big Bear spoke strongly about the aspect of the implementation that included JEA's efforts to implement Six Sigma and the organization-wide process mapping activity. He believed that the process mapping had allowed JEA to come up with detailed processes and applications, and the Ps and Qs for the goals and tracking, which Big Bear felt had been very useful. From Big Bear's perspective,

> Six Sigma is not only project driven, but we have certain projects where we have statistical measurements that are more easily adapted, but [Six Sigma] is also part of our processes and in combination with the process mapping, for example since we implemented it, [JEA has achieved] improved electric reliability and [lowered] EFOR [equivalent forced outage rates]. … I wouldn't separate JEA's efforts to implement Six Sigma from the process mapping, since the process mapping allowed us to come up with detailed processes and applications for JEA, and the Ps and Qs for the goals and tracking.

Pathfinder remarked,

> Six Sigma is project driven and certain projects where statistical measurements are more easily adapted are definitely appropriate for Six Sigma. We identify major DMAICs and then use BB teams on formal major projects and then use DMAICS tools with managers, to improve processes, and today we are using these tools and including the SIPOC model to identify outputs and costs, and Six Sigma concepts are also now part of our processes. I don't think we would have improved as much without Six Sigma, although I think we were on the road to improving, and with Six Sigma we have had an enormous focus on improvements

> of processes. We are also using this to identify incremental areas for improvements.

Regarding whether initiatives were process driven, Osceola answered,

> Yes, it's a bit of both. Some projects are process driven. Process mapping made the organization think about how it did its businesses. There was a lot of "low hanging fruit" which the organization could identify quickly and take advantage of. It increased productivity and increased staff awareness of their processes. The use of DMAICs and the applications of the tools are project driven.

Osceola's implementation was at the level of requiring all projects to have charters with goals and objectives. He said, "Some projects met and some almost met their objectives." Describing how the performance improvement project initiatives were set, he said,

> The initiatives are set intuitively, what's happening, what do customers demand, what defects have we identified, etc., are the decision drivers. What are the customer expectations? One feature that Six Sigma includes is the VOC which is an important tool. It is useful in selecting projects. Some projects have definite dollar gains to be achieved. An example of that was the Northside Unit 3 projects to increase unit capability reduce emissions, etc. and increase its fuel mix flexibility.

Mac said that the "successful outcome of analyses sometimes can be utilized in the tight execution of treasury activities. The areas are not repetitive enough to be effectively using Six Sigma for most activities and other measures may be more effective."

Aphrodite, another executive involved in both the implementation and the on-going TargetSmart activities, said,

> Process mapping and measuring routine tasks are now a way of setting goals and objectives. Meeting performance standards, lab metrics, etc., now run on auto pilot. Objectives are project driven, and gaps are investigated to ensure compliance. For example, in the water and sewer system, planning was always late, and projects to keep up with demand were pushing the edge of meeting needs. An area of obvious focus was on improving delivery time for projects, improving scheduling and delivery of completion performance.

Southside Sioux described goal setting and objectives "in the HR area, initiatives for HR are more advanced because the vice president was very interested in revamping measurements and evaluations to enable it to measure outcomes. The goals included getting inputs from those closest to the areas being measured." Bull said "We developed maps, data collection, analysis, improvement required, etc., and corporate goals, improvements over time against minimum annual goals, which were set *externally*." Builder responded,

> In my unit, the effect has been good. The unit measures project statistics, transactional activities. The organizational culture needed clarity and Six Sigma assisted it in that. And in setting performance improvement project initiatives an important area is cycle time, and Six Sigma helps with that. Additionally there are three or four other terms and components such as the DMAIC process of analyzing that are useful. … Six Sigma causes things to bubble up to the top and where numbers are bad, such as the GIS and "as-builts" work, the system is

> effective in finding root causes and helping identify critical processes which need improvement. It points to areas needing improvement, and causes the unit to look at them and redesign the processes using the Six Sigma tools to get substantial changes and improvements. … The DMAIC process is not always the way things are addressed.

Valkyrie said he linked Six Sigma to the business unit and to the overall organizational goals. With regard to the corporate scoreboard, he said, "it needs to be focused on the problems with the best impact so that the efforts are used for areas which are best suited."

Information on the second theme was also drawn from executives' answers to a question about whether Six Sigma had affected the efficiency of the business unit. Big Bear said,

> I keep restating that Six Sigma and the process mapping, together, have permitted us to make improvements in process steps all over the organization, and help us to make sure that we benefit from improvements in processes in different areas that may have complementary results, not have processes competing in different areas of the business, and to not repeat processes.

Builder said process mapping helped to adequately define the problems, consider the results wanted and to assess the current state of performance. Laura said that her "team sees whether or not they have the right metrics for measuring goals and meeting objectives. Good tool for review of periodic activities and use Six Sigma in monthly feedbacks with staff." Bull remarked that "the process mapping was most valuable, as it did identify blockages and constrictions to the processes and the mapping should be continued and [regularly] review the policies regarding procedures and metrics."

Theme 4: Improvements as a result of Six Sigma. All of the interviewees described improvements from the implementation of Six Sigma at JEA. Builder said,

> Six Sigma has improved the business and its effectiveness. Project management has improved. Another thing this has helped is in the documentation area. Controlling of project management has improved and oversight of projects is better now. … Mapping the processes was a good improvement. If the process is not done right, mapping can identify areas needing change. The management recovery program in project management is better now. The main indicators of costs and scheduling are better, get projects done on time and on budget is a goal setting activity and measuring is improved. … There is more discipline in following the DMAIC process and more rigorous evaluation of projects to be undertaken now. The awards committee is better now and the process of approving projects is improved.

Southside Sioux remarked,

> We can clearly see improvement in measuring activities. … Performance improvement resistance to Six Sigma has been apparent, but once people began to understand the program and the importance of performance management impacts on customer satisfaction, it began to get better. People want to have a say in how they are measured, and recognition needs to be considered. Six Sigma has had enormous benefits at the power plants where it has clearly been effective in finding new and better ways to increase output, improve reliability, and reduce emissions. … HR is a data rich area, with repetitive activities in a number of areas. These areas may have improved in a department, with no continuity

> disconnects, but since there were reorganizations, etc., there is now some mending underway.

Big Bear stated that JEA had experienced a number of improvements including improvement in the equivalent availability of its electric generating units and improved water quality and he attributed these improvements to Six Sigma. He said that although JEA already had been on the road to improving its operating efficiencies, with Six Sigma's implementation, the organization now "had an enormous focus on improvements of processes." In another segment of the interview, he said,

> We have seen the results of Six Sigma: Manufacturing is clear, and we've proven that it is effective at JEA. Implementation – glad we did it. … I think Six Sigma has a sustainable toolbox we can use from now on, even if something else comes along, and we should be able to use these tools. Six Sigma is not a program written by a person, it's an actual mathematical way of doing process improvement. … Six Sigma gives you a way of measuring achievements that we didn't have before so I think we now have goals and objectives that we might not have been able to identify without it.

Mac also described it in this context with this observation: "Six Sigma is a terrific tool set, and appropriately applied, can provide significant returns." He also thought that "the big opportunity for Six Sigma truly lies in operating units with redundant repetitive processes and big leverage for the plants." Overall, Mac said,

> Modest improvements are visible, with increased awareness of cost, and cost drivers, but not significant dollar savings. Overall business unit focus was on being able to do more with less through the Six Sigma tools, in the government

> context because of implied or actual arrangements with employees. In government environment, constraints slows change, the labor force has to be redeployed.

At a different point in the interview, he said,

> There has been a modest improvement in some of the processes, and some systems were improved. There is more improvement to financial systems to understand, and participation in teams focused on operational areas has been useful to the operating processes and their improvements. It has good value to certain projects; limited value to financial services. Improvement focuses on processes, connections and relevance to other areas and connections to other teams has been useful.

Osceola said,

> Parts of the organization have seen successes and other parts have not seen [the improvements] as clearly. People have to develop that passion for process improvement and get experience with it. How to leverage this for sustainability is the question now. … With Lean, employees are engaged more quickly, and it is easier to understand, with less training required. Six Sigma is more successful with a longer more detailed engagement. In the future, we will use the tools of each as appropriate, with Six Sigma process tools to analyze the data and Lean to engage the employees. … At this juncture, though, JEA is a much better company for having done Six Sigma implementation.

Pathfinder said,

It has improved efficiency and productivity. Both in my current position, working in the electric systems processes, and in my last job, working in organizational development, I feel Six Sigma has been very helpful. If you look at the data in my last job, we did improve the quality of our services, reducing costs, reduced defects, etc., the 2001-2004 timeframe we achieved proper and performance improvements through Six Sigma. In my new job, I have five direct reports and those who aggressively use Six Sigma are getting benefits out of it and where it has been deployed it is effective.

Aphrodite commented,

A big area of improvement has been achieved in reducing cycle time for project completion, and improvements in quality of production. … An element that was added of business reviews has been a practice to show significant changes and quantitative measurement has been added to the qualitative reviews. … In specific projects Six Sigma has had greater impacts. The company has recently been engaged in reassessment of Six Sigma and how to move on. JEA is assuring alignment to goals and objectives and making sure that maps around key processes are reviewed. [JEA is] still using Six Sigma and making sure the right processes are being worked on and improving linkages between processes, an effort is underway to avoid metrics over which managers don't have control to ensure accountability measures are correct.

Bull said that over time there had been positive results and that Six Sigma was applicable to a lot of areas such as operating, construction, power plants, and water processes.

Theme 5: Implementation could have been better. While commenting on the benefits of Six Sigma, all of the interviewees had comments about how its implementation could have been better. Bull said,

> One significant negative was the implementation mechanism, which was combined with a process based reorganization of the company so that it seemed to create "silos." Cross functionality, which should have resulted, was impeded by the process based reorganization, and rather than improve it, gaps were created.

Bull felt it would take years to identify the gaps created and then fix them. He called these gaps "white spaces" in the organization. He said JEA "had never really successfully used it [Six Sigma] in the business unit; [there were] few areas with enough metrics to use Six Sigma. Six Sigma negatively affected the unit, with siloing as a result between processes." In the organization, Bull was not sure of the perception, but felt that in some areas it was working well, less so or not at all in others.

Valkyrie observed these white spaces in development as well and said that process mapping and tracking metrics were affected by them. "People are only measured on things they could change, but there are white spaces that no one managed and friction has evolved. The end results weren't coming through. This has created some negative perceptions." In other comments regarding the implementation, Valkyrie said,

> It relies on experts facilitating a team, and with a small team, it results in "outsiders" involvement, and buy in is resisted. Other tools may be better in some instances, such as Lean. The team piece of Lean is valuable as it helps get buy in from employees, and doesn't need outside experts. Group training and support result in the team looking for ways to do their jobs better.

He also said,

> [Six Sigma] has been implemented wrong in a lot of organizations. There are two main pieces, process flow, 5 steps of DMAIC, and it could be broken down into 11 to 17 steps. People need to understand the change management piece of Six Sigma, and its impact on organizational change. When some parts of the organization do it and others don't embrace process improvement, people who are doing the process improvement need to understand the change management piece.

Another thing that hurt the implementation according to Valkyrie was the "one size fits all" approach:

> Six Sigma should have been implemented first in areas where it made the most sense. With regard to the training piece, did the people taking the training have a clear understanding of how they supported the organization major vision and goals? The one size fits all forced it to all levels without any discussion as to why. GB projects had to be done, and people thought Six Sigma was in addition to their job.

On a slightly different topic, Six Sigma's overall efficiency once it was applied to a specific project, Valkyrie remarked,

> JEA uses lots of other things, such as financial analysis, engineering studies, benchmarking, Lean, etc. … At the organizational level, where a huge success at Northside Unit 3 has been achieved in efficiency, etc., an effect has been noticed that although some units were made more efficient, they have not resulted in using fewer people. With regard to Six Sigma versus Lean, they find that with more full time employees (FTEs) in an area after the improvement is made, it has

been possible to relocate FTEs but not enough has been done in that regard. As a result while there have been process improvements, less success in use of human resources freed up by the improvements.

Laura said her "staff embraced the training and benefited from it." However, she said that "too much time has been spent on collecting metrics and it could have been more selectively applied." And that there [was] "some lingering doubt as to benefits, a lot of angst. Using a more simplistic approach might have been better and resulted in better understanding of tools. There was a tendency toward complexity." Builder agreed, and said that JEA "still has the opportunity to improve more: [it could] align with the strategic model, the circle, and make sure the organization is in alignment."

According to Southside Sioux,

> JEA had driven its implementation, and was too hasty in trying to see benefits. People should have been able to get a much better understanding of what can be measured, and what should be measured; quality, effectiveness, process improvement, timeliness. Six Sigma has improved productivity in some areas which are data rich, but when JEA implemented in it a "one size fits all" format, it was not as effective since one size does not fit all. … Site specific deployment is important to its effectiveness. It should have been more site specific, and there should have been more efforts made to demonstrate its performance improvement in order to get employee buy-in. … Six Sigma, if properly deployed, can be of enormous benefit to a data driven organizational area. Setting it up organization-wide set back the benefits. Performance management, [you] can't manage it if you don't manage for a complex business. In areas of intellectual workers, Six Sigma

doesn't seem to be very effective, so in those areas where it doesn't work, we should dismantle what isn't working.

Osceola said,

Process improvement is seen by some as good, others less so. The forced mapping of processes and focus on process improvement sucked resources away to some extent. … Some managers still have a wait and see attitude. This created resistance and some didn't see the benefits of Six Sigma. … It could have been much better. Implementation as one size fits all and mapping all processes wasted resources too much. The communication of why it's being implemented was not good. It was hard to have success in some areas which didn't fit as well, while mapping, auditing, and etc., created angst among staff. Some buckled down and really did some good stuff, while others just went through the training but really didn't get it. It created a bad taste in some people's view. … We now have seen the value and have some 400 processes we actively monitor. We should have picked the processes more carefully at the beginning. And while the training was good, does every manager need to be GB certified?

Mac said,

The original implementation of Six Sigma went too far in scale and scope. [Over the past] several years, JEA tried to scale back Six Sigma and use it in a more passive approach. There is a need to revitalize Six Sigma for use in appropriate and specific projects where Six Sigma tools can be targeted. [The] implementation of Six Sigma, in order to be successful, needs to be viewed as

> change management, external to existing organization. … Also [I] believe from overall performance management system, JEA tried to overreach in its application.
>
> Aphrodite observed.
>
> The DMAIC format could be better standardized, and an overall corporate language for projects where DMAIC is used can be developed. Success formally pulls people together and it helps provide a mechanism to solve problems in a formal way. JEA implemented it with a top down approach. This was not the best way, but who knows. It left a sour taste in people's mouths. JEA's organizational culture has been that people don't normally do things that way. … There is still some negative perception visible. People still not involved and some areas where Six Sigma is not well received. … The working level staff in the organization may not understand how Six Sigma links to the overall corporate metrics. There is always a need to better align the workforce, and to reassess and reevaluate job performance.

In another segment of the conversation, Aphrodite remarked,

> A lot of people don't understand daily process management and Six Sigma implementation was not effective as it might have been as people were not ready to undertake it. It was top down and JEA did not spend much time or effort in educating staff as to merits of Six Sigma. It was dictatorial and as a result there was not as much employee buy in. Employees that were not involved in improvements are under engaged in the implementation.
>
> Big Bear said,

> Yes, [we] could have done it differently: different type of training, some areas probably shouldn't have had to do it. We should have done the process map training better. [We] did have similar duties done in different areas, didn't have good communications across the organization, and all of these were improved by the process mapping. I don't know if it could have been implemented better, but as a performance program no one knew anything about it, so the way we did it was to introduce and require it across the board.

Pathfinder said,

> In the introduction of Six Sigma to the organization, I would have emphasized the "getting on board" activities, and where we used the consultants to audit progress, we alienated a lot of people, and later on we watered down our expectations. We did not do a good education job as to why people should adopt Six Sigma and not much effort went into the WHY we are doing Six Sigma. Later on we backed off and Six Sigma became optional.

Member Checks

"Member checking is a process where the researcher asks one or more participants in the study to check the accuracy of the account" (Creswell, 2002, p. 280). This is sometimes also described as respondent validation. Member checking (or validation) is a well known qualitative research procedure where the researcher submits materials (interview transcripts or other research material) from a research study to participants who were the source of those materials. The participants may also be asked to review the general themes and other aspects of the study and indicate whether or not the representations present the information accurately (Creswell). Member checking, along

with other strategies, is necessary for qualitative researchers to ensure "trustworthiness" (Lietz, Langer, & Furman, 2006). For this study, member checking was done with two participants, Big Bear and Valkyrie, using an interview format and a short report including a summary of the general themes and the interview transcript for each of the participants.

In the member check conducted with Big Bear, he noted that there had been some references to a possible decline in the application of Six Sigma and said that since the original interview there had been some changes. He offered the following statements as clarification.

> We wanted to implement Six Sigma everywhere in a very detailed way, meaning in every part of the organization, but we later on we realized that we really shouldn't do that, that it's probably more applicable in some areas rather than in others. We more strongly see that now, several months later after we talked before, and Six Sigma is not going to go away. As a matter of fact, I talked about integrating Six Sigma with wiring diagrams where you wire processes together and you apply Six Sigma to get the metrics; Ps and Qs out of the process maps. We have started a new project called the "Genome Project" (sort of tongue in cheek we decided to call it the genome project) where we plan to wire all of the [JEA] processes together. It might be a map that covers a wall. Our BB group is working on it. Also, where in the earlier interview it was discussed that the current CEO wasn't applying Six Sigma as intensely as the past CEO, it occurred to us during the change that Six Sigma shouldn't be applied as intensely in some areas as others. In fact, while it isn't widely publicized, we have been in a "stand-

> down" period regarding Six Sigma and we are looking at which areas could be better served by Six Sigma and a focused effort on Six Sigma, and we certainly are doing that. Part of the review will require the "Genome Project" being continued, so that we can see how all of the processes can be wired together and continue focusing on the Ps and Qs.

In other comments, he said regarding expectations as discussed in Theme 1, "I will say that [expectations] applies mostly to operational types of processes at JEA. Expectations were high, and that we are meeting those expectations to a high degree." He said that he did feel that a common language had "evolved as part of the organizational culture." As for change management effects, he felt they had "occurred in the manufacturing/operations areas" primarily. And in regard to where implementation of Six Sigma could have been better, he said, "WorkSmart, while it was useful, it lacked the tools that Six Sigma has, and perhaps we could bring back WorkSmart, and combine it with the application of Six Sigma tools."

Valkyrie also spoke of combining WorkSmart with TargetSmart:

> The one thing I would add to that, there are good prequels to Six Sigma, people have found more inclusive easy to grasp process improvements types of tools, and then once the "low hanging fruit is taken," then Six Sigma could be introduced for the more complex types of process improvements.". "For example, WorkSmart [which JEA had done just before Six Sigma] had the worst part of Six Sigma without any tools (the best part). The worst part of Six Sigma is the structured methodology [of the implementation] and the documentation that's required for it,

> and the best part of Six Sigma is the actual implementation of process improvements and the measurement to make sure you're right.

Regarding a comment he had made about the success of Unit 3, he added that "success has been achieved in all three of the Northside Units. We have actually had just as good a result from Six Sigma projects at Units 1 and 2 as we have had with Unit 3."

In summary, Valkyrie said,

> In talking about productivity, something else that's become very clear to me is that 10 years from now, we're going to have to raise a generation of people who can do similar work to the quality engineers we have now, but due to the increasing demand for these engineers we will have to make other arrangements to have the skill levels we need. I see Six Sigma as being an important way to train those people who are bright enough to learn these skills, and that with these tools and others, we should be able to meet the future demand for skilled staff.

Survey Phase Analysis

Survey instrument. The survey instrument was completed by 94 respondents, 47% of 200 solicited by the researcher in an effort to determine whether there were organizational cultural differences between group levels in the organization. The survey also included specific questions regarding the implementation of Six Sigma, which the researcher wished to examine among the groups. The survey was designed by Cooke and Lafferty (1989a) to first establish the organizational culture via the OCI© and then to consider the organization's culture effectiveness (Cooke & Lafferty, 1989b) against a standard developed by HSI over the history of the survey instrument. An example of the OCI© ideal culture diagram is presented in Figure 5, and OCI© results for the groups

examined are presented in Figure 6. Several management level groups in particular were of interest to the researcher: Top management (CEO, president, vice president (N = 5), senior management (N = 9), middle management (N = 23), BBs (N = 4), and GBs (N = 54). Discriminant function analysis was used for the statistical examination of the data received from the survey instrument.

Discriminant analysis of the survey instrument data. Discriminant analysis has been used in this study to analyze whether there is a difference in the organizational culture among and between the organizational groups at JEA, the location of the study. Discriminate function analysis is a multivariate technique for considering latent dimensions of one or more normally distributed interval independent variables for predicting group membership in the categorical dependent variable. This type of analysis is used for building a predictive model of group membership based on observed characteristics of each case. The procedure generates a discriminant function (or, for more than two groups, a set of discriminant functions) based on linear combinations of the predictor variables that provide the best discrimination between the groups. The functions are generated from a sample of cases for which group membership is known and can then be applied to new cases that have measurements for the predictor variables but have unknown group membership. The grouping variable can have more than two values. The codes for the grouping variable must be integers, however, and their minimum and maximum values must be specified. Cases with values outside of these bounds are excluded from the analysis (Hair, Anderson, Tatham, & Black, 1998; SPSS, 2007).

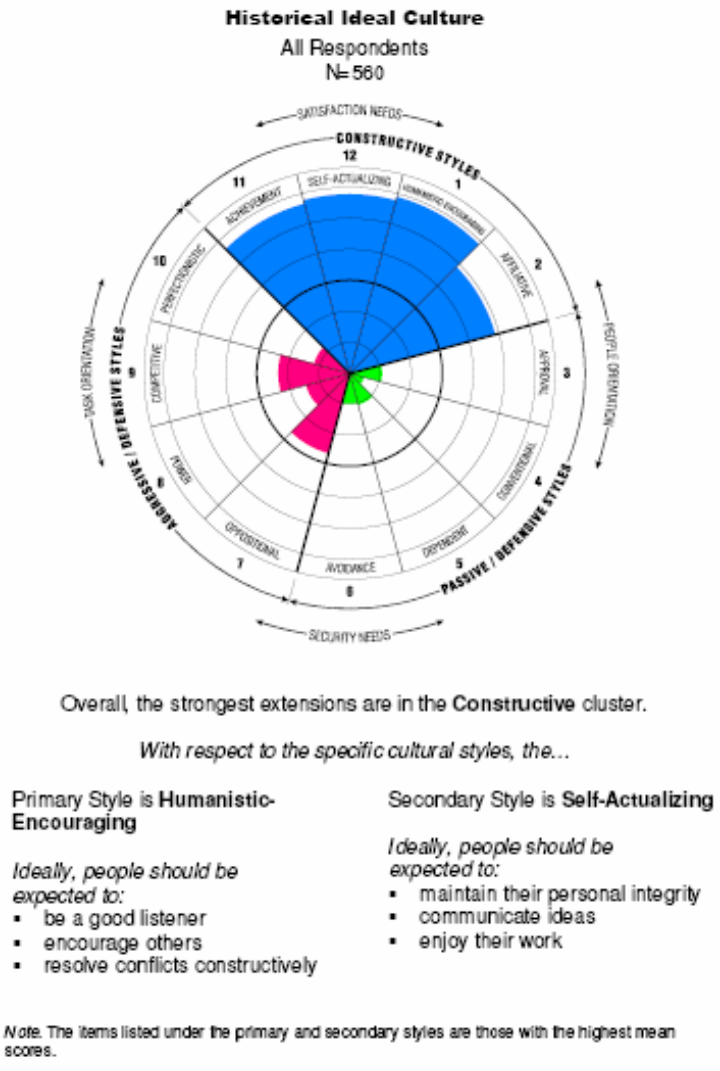
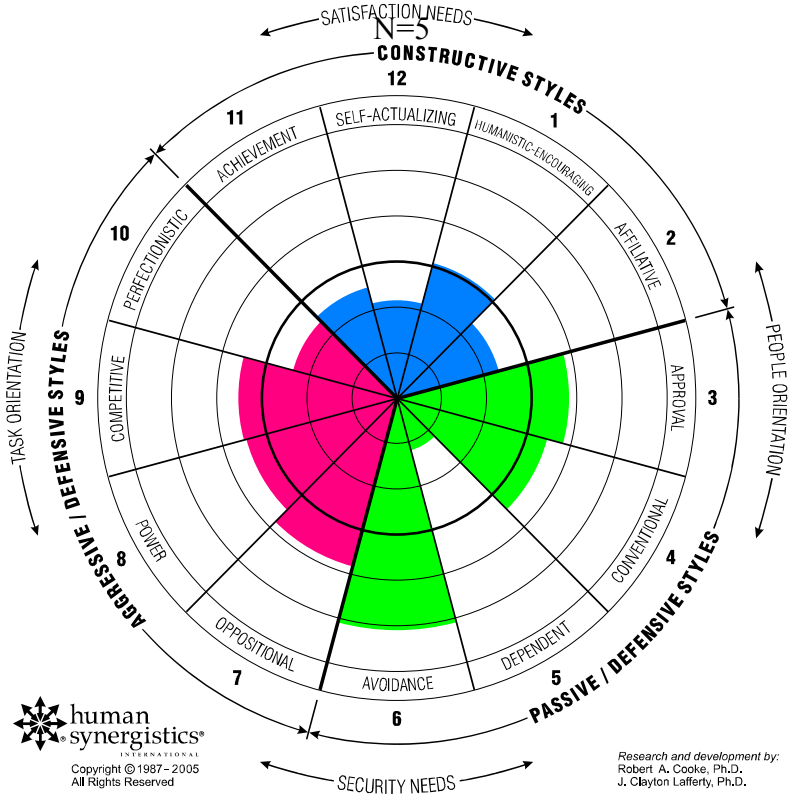


Figure 5. The OCI© Ideal Culture Diagram.

In comparison with the Ideal Culture illustrated above in Figure 5, the following is the result of the research output by HIS, and reflects the JEA current operating culture.

Current Operating Culture



Overall, the strongest extensions are in the **Passive/Defensive** cluster.

With respect to the specific cultural styles, the

Primary Style is **Avoidance**

People are expected to:

- push decisions upward
- put things off
- never be the one blamed for problems

Secondary Style is **Oppositional**

People are expected to:

- question decisions made by others
- be hard to impress
- point out flaws

Note. The items listed under the primary and secondary styles are those with the highest mean scores.

Figure 6. The OCI© CEO president: Executive/senior vice president diagram.

In the present study, analyses were conducted on the following independent variables (subscales or behavioral norms): Humanistic-Encouraging, Affiliative, Approval, Conventional, Dependent, Avoidance, Oppositional, Power, Competitive, Prefectionistic, Achievement, and Self-Actualizing, which were selected for discriminant function analysis in SPSS.

Computationally, SPSS performs a canonical correlation analysis that will determine the successive functions and canonical roots (the term root refers to the eigenvalues that are associated with the respective canonical function). The maximum number of functions will be equal to the number of groups minus one, or the number of variables in the analysis, whichever is smaller. One of the initial outputs examined from the statistical analysis is the eigenvalues attributed to the functions, along with the Wilks' Lambda, the standardized canonical discriminant function coefficients, the structure matrix and functions at group centroids. Additionally, the measures of Hotelling's trace and Pillai's criterion provide evaluations of the statistical significance of the discriminatory power of the discriminant function (Hair et al., 1998).

> According to Hair et al. (1998), discriminant analysis and logistic regression are the appropriate statistical techniques when the dependent variable is categorical (nominal or nonmetric) and the independent variables are metric····· [It is] the appropriate technique for testing the hypothesis that the group means of a set of independent variables for two or more groups are equal – multiplies each independent variable by its corresponding weight and adds these products together. The result is a single composite discriminant Z score for each individual in the analysis. (pp. 244-245)

The average of the discriminant scores for all group members gives the group mean, also called a centroid.

Discriminant analysis has two steps: (a) a multivariate F test (Wilks' Lambda), which is used to test if the discriminant model as a whole is statistically significant, and (b) if the F test is statistically significant, then the individual independent variables are assessed to see which differ by group and these are used to classify the dependent variable (Griffin, 2007; Hair et al., 1998). Discriminant analysis shares all the usual assumptions of correlation, requiring linear and homoscedastic relationships, and untruncated interval or near interval data. Like multiple regression, it also assumes proper model specification (inclusion of all important independents and exclusion of extraneous variables). Additionally, discriminant analysis assumes the dependent variable is truly categorical. Data forced into categorical coding are truncated, attenuating correlation (Hair et al.).

For the present analysis, the OCI© questionnaire behaviorial norms were analyzed with a discriminant function analysis of the OCI© subscale scores. A discussion of the Appendix IV OCI© – OEI™ Group Cultures, by Organizational Level concludes the quantitative research. The SPSS discriminant function analysis output of the OCI© subscale scores is presented in Table 5.

Table 5.
Group Statistics

Organizational Level		Mean	Std. Deviation	Valid N (listwise)	
		Unweighted	Weighted	Unweighted	Weighted
1	Humanistic-Encouraging	31.54	9.039	26	26.000
	Affiliative	32.27	8.200	26	26.000
	Approval	28.65	8.731	26	26.000
	Conventional	32.27	7.826	26	26.000
	Dependent	35.69	7.320	26	26.000

	Avoidance	25.77	9.274	26	26.000
	Oppositional	23.88	5.062	26	26.000
	Power	29.19	6.759	26	26.000
	Competitive	28.69	8.293	26	26.000
	Perfectionistic	30.99	6.743	26	26.000
	Achievement	33.55	7.729	26	26.000
	Self-Actualizing	28.96	7.443	26	26.000
2	Humanistic-Encouraging	41.14	5.984	7	7.000
	Affiliative	40.86	5.872	7	7.000
	Approval	33.43	6.294	7	7.000
	Conventional	33.57	8.522	7	7.000
	Dependent	35.00	6.403	7	7.000
	Avoidance	26.14	10.123	7	7.000
	Oppositional	25.14	6.176	7	7.000
	Power	29.57	9.502	7	7.000
	Competitive	26.86	3.338	7	7.000
	Perfectionistic	29.71	5.823	7	7.000
	Achievement	38.71	5.559	7	7.000
	Self-Actualizing	35.00	3.559	7	7.000
3	Humanistic-Encouraging	33.92	6.507	24	24.000
	Affiliative	34.50	6.705	24	24.000
	Approval	29.05	6.240	24	24.000
	Conventional	29.96	8.191	24	24.000
	Dependent	32.58	8.293	24	24.000
	Avoidance	24.66	8.277	24	24.000
	Oppositional	22.48	3.821	24	24.000
	Power	26.47	7.204	24	24.000
	Competitive	26.30	8.223	24	24.000
	Perfectionistic	27.67	6.605	24	24.000
	Achievement	34.50	7.757	24	24.000
	Self-Actualizing	31.19	6.770	24	24.000
4	Humanistic-Encouraging	35.56	7.732	9	9.000
	Affiliative	35.89	8.724	9	9.000
	Approval	30.22	7.429	9	9.000
	Conventional	30.11	8.824	9	9.000
	Dependent	31.78	8.318	9	9.000
	Avoidance	26.00	9.618	9	9.000
	Oppositional	21.98	5.498	9	9.000
	Power	26.89	6.772	9	9.000
	Competitive	27.44	9.825	9	9.000
	Perfectionistic	29.44	7.876	9	9.000
	Achievement	35.22	7.067	9	9.000
	Self-Actualizing	32.33	7.071	9	9.000

5	Humanistic-Encouraging	32.50	5.447	4	4.000
	Affiliative	34.50	3.697	4	4.000
	Approval	32.50	3.873	4	4.000
	Conventional	32.00	5.598	4	4.000
	Dependent	27.50	7.326	4	4.000
	Avoidance	29.75	8.180	4	4.000
	Oppositional	25.00	3.742	4	4.000
	Power	28.00	3.559	4	4.000
	Competitive	26.25	5.737	4	4.000
	Perfectionistic	29.75	3.403	4	4.000
	Achievement	32.75	9.535	4	4.000
	Self-Actualizing	29.00	4.163	4	4.000
6	Humanistic-Encouraging	48.00	.(a)	1	1.000
	Affiliative	42.00	.(a)	1	1.000
	Approval	18.00	.(a)	1	1.000
	Conventional	17.00	.(a)	1	1.000
	Dependent	21.00	.(a)	1	1.000
	Avoidance	10.00	.(a)	1	1.000
	Oppositional	18.00	.(a)	1	1.000
	Power	16.00	.(a)	1	1.000
	Competitive	13.00	.(a)	1	1.000
	Perfectionistic	18.00	.(a)	1	1.000
	Achievement	44.44	.(a)	1	1.000
	Self-Actualizing	42.00	.(a)	1	1.000
9	Humanistic-Encouraging	32.80	10.640	5	5.000
	Affiliative	33.20	10.232	5	5.000
	Approval	29.00	10.488	5	5.000
	Conventional	29.00	11.023	5	5.000
	Dependent	33.00	6.285	5	5.000
	Avoidance	24.40	11.845	5	5.000
	Oppositional	23.40	6.877	5	5.000
	Power	29.20	10.640	5	5.000
	Competitive	26.80	11.389	5	5.000
	Perfectionistic	29.40	11.104	5	5.000
	Achievement	34.80	8.408	5	5.000
	Self-Actualizing	31.20	9.311	5	5.000
Total	Humanistic-Encouraging	34.00	8.165	76	76.000
	Affiliative	34.50	7.733	76	76.000
	Approval	29.49	7.547	76	76.000
	Conventional	30.97	8.209	76	76.000
	Dependent	33.38	7.770	76	76.000
	Avoidance	25.39	9.081	76	76.000
	Oppositional	23.28	4.875	76	76.000
	Power	27.86	7.309	76	76.000

Competitive	27.16	8.178	76	76.000
Perfectionistic	29.30	6.962	76	76.000
Achievement	34.71	7.553	76	76.000
Self-Actualizing	30.94	7.012	76	76.000

a Insufficient data

This discriminant analysis yielded eigenvalues for the functions with over 93.7% of the cumulative variance being taken up by the first four functions (Table 7).

Table 6.

Summary of canonical discriminant functions

Eige nvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	.415(a)	38.8	38.8	.542
2	.358(a)	33.4	72.2	.514
3	.162(a)	15.2	87.4	.374
4	.068(a)	6.3	93.7	.252
5	.048(a)	4.5	98.2	.215
6	.019(a)	1.8	100.0	.138

a First 6 canonical discriminant functions were used in the analysis.

The ratio of the eigenvalues indicates the relative discriminating power of the discriminant functions. The ratio of the first two eigenvalues above is 1.86, and the first discriminant function accounts for 86% more between-group variance in the dependent categories than does the second discriminant function. The first three canonical correlations are moderate. The first two functions show correlations above .514, with the next four functions all showing smaller correlations.

Table 7.

Wilks' Lambda.

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 6	.392	61.283	72	.812
2 through 6	.555	38.535	55	.955
3 through 6	.754	18.482	40	.999
4 through 6	.877	8.630	27	1.000
5 through 6	.936	4.349	16	.998
6	.981	1.260	7	.989

Based on the Wilks' Lambda, the test for functions 1 through 6 showed that none were statistically significant at the .05 level. The Wilks' lambda showed that the overall F, for the test of functions 1 through 6 was not statistically significant at the .05 level. Wilks' lambda showed the overall effect size to be large for the first two tests, moderate for tests 3 and 4, and negligible for the remaining two tests. Natesan and Thompson, (2007) proffered the overall effect size to be a suitable alternative to stepwise methods for evaluating the importance of different predictors in a multiple regression analysis, and better understanding prediction dynamics. Commonality analysis is another method for more fully conceptualizing and representing regression dynamics (Zientek & Thompson, 2006, p. 305).

> Effect sizes ⋯ are useful quantifications of intervention impacts in a single study. "Effect sizes are particularly valuable when we (a) formulate anticipated study effects prior to the intervention by consulting effects from previous related studies and (b) interpret actual study effects once the study has been conducted in the context of prior effects." (Thompson, 2002, p. 69)

Table 8 shows the average discriminant function value for each organizational level, showing the functions evaluated at group means.

Table 8.

Functions at group centroids.

	Function					
Organizational Level	1	2	3	4	5	6
1	-.634	.017	.283	-.003	-.081	.053
2	.742	1.493	.268	.179	.149	-.020
3	.031	-.127	-.284	.012	-.052	-.163
4	.511	-.428	-.423	.353	-.013	.228
5	1.654	-1.052	.916	-.304	-.068	-.021
6	.776	1.513	-1.221	-1.489	-.736	.370
9	-.289	-.264	-.213	-.382	.689	.065

Unstandardized canonical discriminant functions evaluated at group means

The plots in Figures 7 through 10 show the canonical discriminant functions and group Centroids for Functions 1 and 2 by organizational level and by all groups combined.

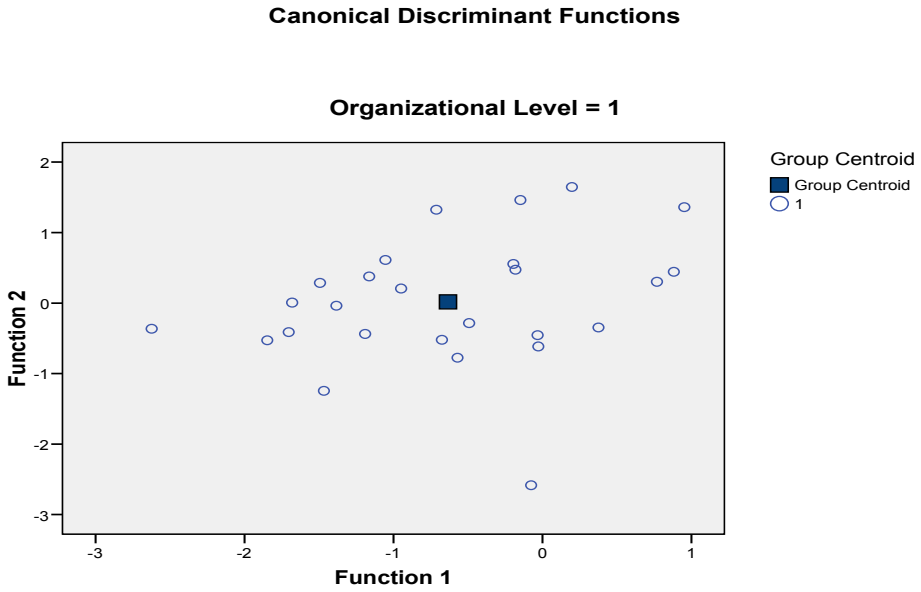


Figure 7. Canonical discriminant functions for organizational level 1.

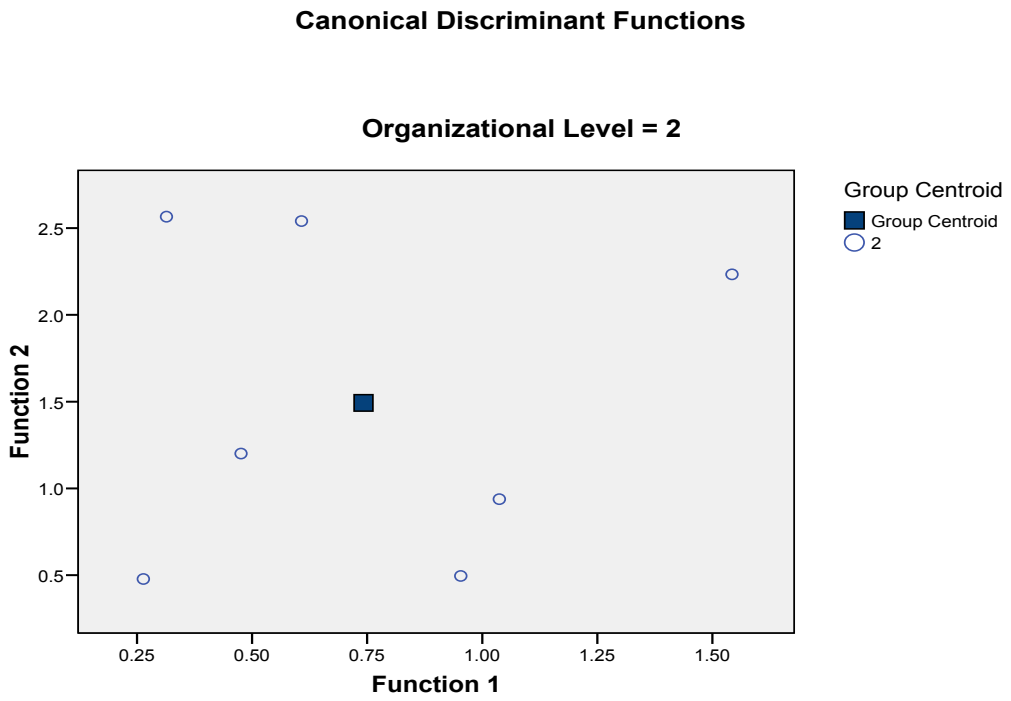


Figure 8. Canonical discriminant functions for organizational level 2.

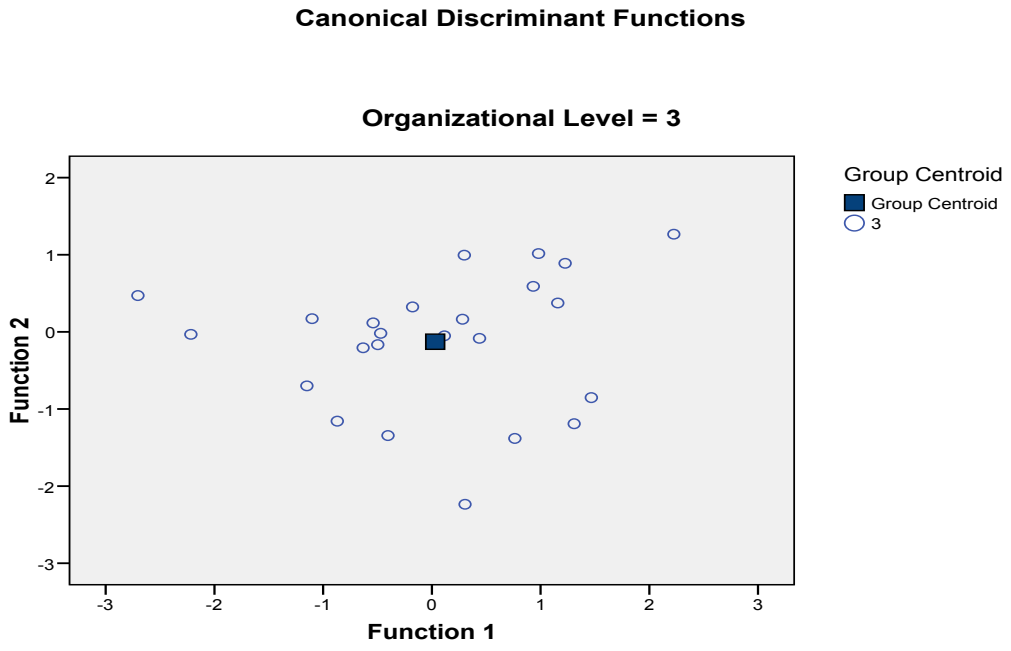


Figure 9. Canonical discriminant functions for organizational level 3.

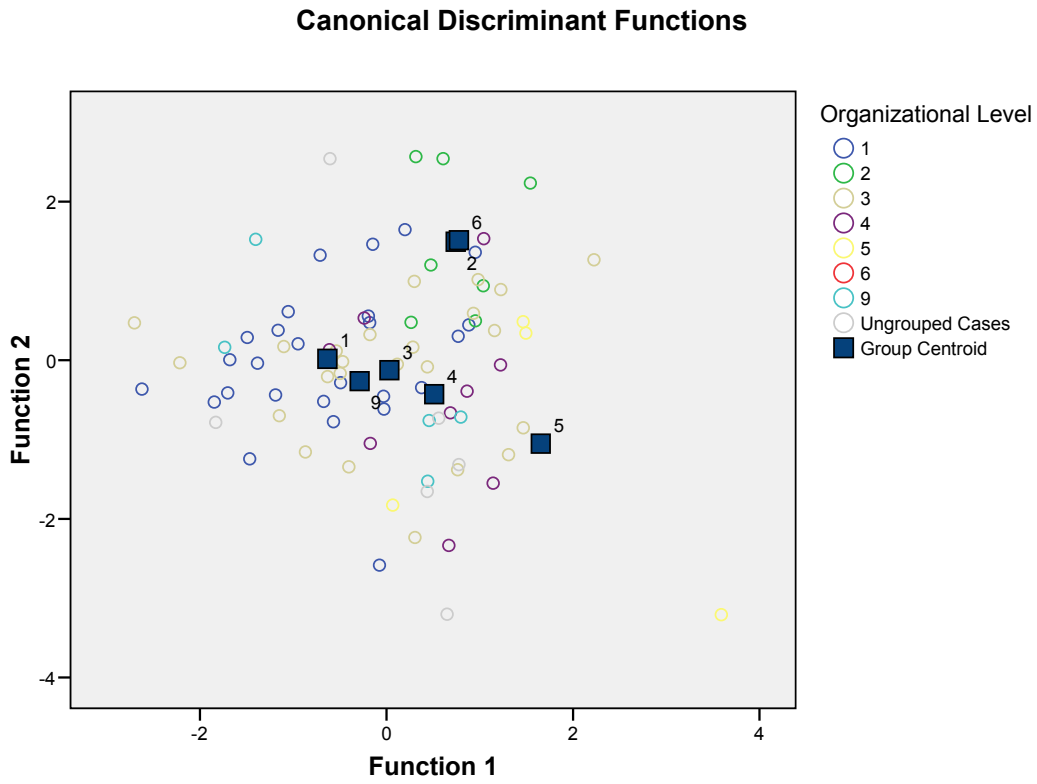


Figure 10. Canonical discriminant functions for all groups.

In figure 9 it is notable that the group centroids for the groups 1, 3, 4 and 9 are clustered particularly close to one another and near the center of the cluster. Groups 2 and 6 are close to one another and like group 5, are away from the center of the cluster.

> According to Thompson, Diamond, McWilliam, Snyder, and Snyder (2005), Correlational evidence is most informative when exemplary practices are followed with regard to (a) measurement, (b) quantifying effects, (c) avoidance of common macro-analytic errors, and (d) use of confidence intervals to portray the consistency of possible effects and the precisions of the effect estimates. (p. 192)

While well designed studies may yield promising results, there is always the possibility that any canonical results obtained may be subject to biases in the sample (Thompson, 1991). The basic logic of result cross-validation (Oxford & Daniel, 2001)

can assist the researcher in making preliminary judgments about the generalizability of results obtained in a canonical correlation analysis.

Replicability is a very important scientific concept that essentially means that the outcome of a particular study will occur again if the study is replicated by another investigator. A scientific finding that cannot be replicated is immediately discredited. According to Crowley and Thompson (1991),

> It is critically important to evaluate the influences of sampling error on obtained results, i. e.; the replicability or the invariance of results. Contrary to somewhat common misconceptions, statistical significance testing does not inform judgment regarding the probable replicability of the sampling-specificity of results. (p. 5)

Oxford and Daniel (2001) described "sample splitting or invariance procedures" as an analysis tool that can be used to establish confidence in the replicability of research findings. As Oxford and Daniel stated, the use of invariance analysis is not complicated, and is logically supported as the procedures recalculate from the standard set of data and show comparably the empirical results. The more similar the results, the more generalizable the data. The basis can also be made supportive, which can be useful for increasing the confidence level of a conclusion that the research study findings are generalizable. "Canonical correlation analysis is a useful and powerful technique for exploring the relationships among multiple dependent and independent variables. The technique is primarily descriptive, although it may be sued for predictive purposes" (Hair et al., 1998, p. 462).

The classification function coefficients can be used to determine to which group each case most likely belongs. For each predictor variable there are as many

classification functions as there are groups. For each group in the sample, SPSS then determines the location of the point that represents the means for all variables in the multivariate space defined by the variables in the model (Hair et al., 1998). These points are called group centroids, as described and illustrated earlier. Information on the classification function coefficients is illustrated in Table 9.

Table 9.

Classification Function Coefficients by Organizational Level

	Organizational Level						
	1	2	3	4	5	6	9
Humanistic-Encouraging	**1.591**	**1.968**	**1.549**	**1.548**	**1.590**	**2.055**	**1.470**
Affiliative	-.676	-.801	-.707	-.716	-.653	-1.102	-.745
Approval	-.800	-.758	-.660	-.583	-.522	-.821	-.579
Conventional	**1.416**	**1.713**	**1.398**	**1.373**	**1.483**	**1.659**	**1.224**
Dependent	**.752**	**.644**	**.671**	**.566**	**.150**	**.669**	**.714**
Avoidance	.201	.210	.271	.361	.426	.261	.207
Oppositional	**1.053**	**1.192**	**.924**	**.774**	**1.012**	**1.164**	**.937**
Power	.121	.216	.069	.011	.040	.135	.247
Competitive	-.074	-.142	-.070	-.034	-.146	-.244	-.172
Perfectionistic	-.643	-.832	-.673	-.573	-.498	-.876	-.616
Achievement	.317	.333	.307	.299	.422	.309	.305
Self-Actualizing	**.699**	**.750**	**.847**	**.905**	**.537**	**1.020**	**.887**
(Constant)	-62.307	-79.639	-61.212	-61.816	-58.732	-73.521	-59.684

Fisher's linear discriminant functions

The discriminant function coefficients denote the unique (partial) contribution of each variable to the discriminant function(s), while the structure coefficients denote the simple correlations between the function(s) and the variables (Hair et al., 1998). In reviewing the discriminant function coefficients for the several groups, certain of these (bolded in the above table) appeared to provide important contributions. Thompson, Cook, and Kyrillidou (2006) discussed this type of outcome in their qualitative analysis of comments regarding a library system questionnaire, where they described that the highest correlations involved scores on augmentation items. The items discussed above

reflected a similar concentration of focus toward being cooperative, with the exception of the two negative items: “win against others” and “out-perform their peers.” This observation is thus comparable to those of both the higher positive and negative discriminant function coefficients illustrated above.

As illustrated below in Figure 11, territorial maps provide a nice picture of the relationship between predicted groups and the discriminant functions. The asterisk (∗) marks the group centroid. Subjects with low *D* and high *D* scores fall in the upper left side of the map (Function 1), while those with low scores on both discriminant functions are classified on the lower and right sides of the map (Function 2).

Table 10

Structure Matrix

	Function					
	1	2	3	4	5	6
Humanistic-Encouraging	**.389**	**.499(*)**	-.357	-.073	-.055	**.384**
Affiliative	**.385**	**.389(*)**	-.206	**.109**	**.048**	**.121**
Oppositional	.002	.097	**.561(*)**	**.150**	**.344**	-.155
Self-Actualizing	.280	.350	-.448(*)	-.151	**.054**	.316
Dependent	-.391	.175	**.298**	**.640(*)**	**.290**	-.135
Approval	.226	.053	**.319**	**.611(*)**	**.487**	-.308
Conventional	-.058	.055	**.513**	**.609(*)**	**.165**	-.203
Competitive	-.180	-.088	**.321**	**.597(*)**	**.250**	.075
Avoidance	.069	-.142	**.414**	**.516(*)**	**.246**	-.149
Power	-.137	.034	**.482**	**.393**	**.576(*)**	.110
Perfectionistic	-.161	-.056	**.500**	**.505**	**.319**	**.511(*)**
Achievement	.167	.333	-.242	-.158	**.021**	.343(*)

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions
Variables ordered by absolute size of correlation within function.
* Largest absolute correlation between each variable and any discriminant function

The structure coefficients matrix is another way of interpreting the magnitudes of the coefficients between the predictor variables and the function within a group. As mentioned earlier, the discriminant function coefficients denote the unique (partial)

contribution of each variable to the discriminant function(s), while the structure coefficients denote the simple correlations between the function(s) and the variables. The squared structure correlation indicates the contribution made by a given variable to the explanatory power of the canonical variate based on the set of variables to which it belongs (Hair et al., 1998). As presented in Table 10, Humanistic-Encouraging and Affiliative are positively correlated for functions 1 and 2, and the table above also exhibits positive correlations with seven or more of the subscales in functions 3, 4, and 5. The largest absolute correlation between each variable and any discriminant function in nearly all cases are positive correlations near or above .500.

The Wilks' Lambda (Table 7) tested the null hypothesis that in the population the groups did not differ from one another on mean *D* for any of the discriminant functions.

> Situations in which standardized-difference effect sizes are needed in the reporting of results … is [sic] particularly the case in experimental or quasi-experimental designs when the mean difference between experimental and control groups is of interest. … The complement of the Wilks' Lambda statistic (1 - Wilks' Lambda) has been used to indicate variance-accounted-for in multivariate tests. (Vacha-Haase & Thompson, 2004, pp. 8-9)

Figure 11 shows the results of the subscale analysis, and on this territorial map, the responses are also similar with a somewhat greater distribution in the function one of subscale items 2, 4, and 5, and with the group centroids being more closely banded near the center, and only centroids 6 and 5 being somewhat further away from the cluster.

Territorial map (Subscales). Canonical Discriminant (Assuming all functions but the first two are zero) Function 1 - Function 2 * Indicates a group Centroid

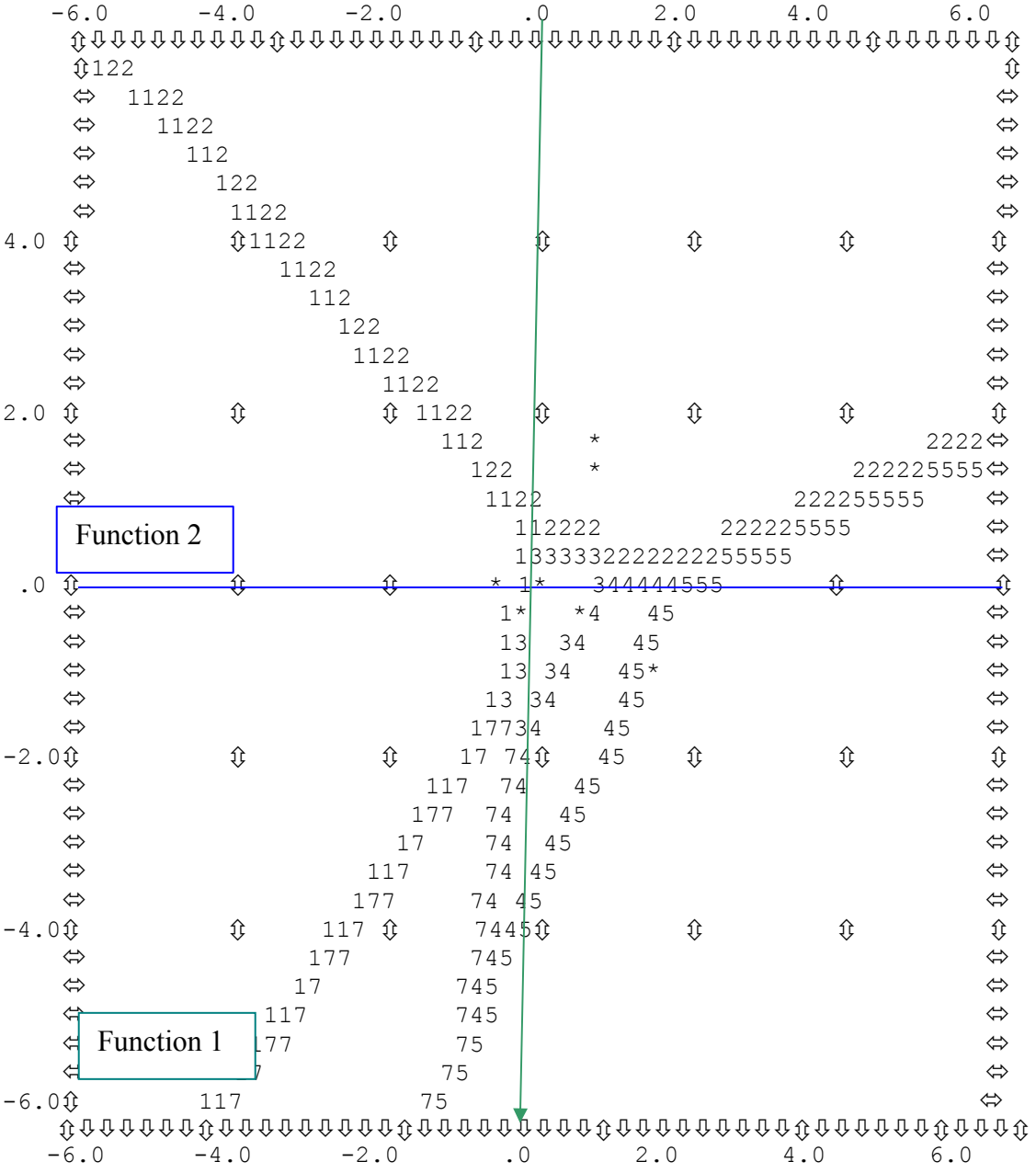


Figure 11. Territorial Map

The canonical discriminant functions for the organizational levels 1 though 6 and 9 are above, and are shown in the grouping along with the group centroids (Table 8). The groups are similarly plotted with the exception of groups 6 and 9, consisting of staff

below the level of manager. Group 6 had only one respondent, while group 9 had five. "The contributions of individual variables to the synthetic, linear combination of the variables (e.g., scores in regression, function scores in canonical correlation analysis) should be evaluated by examining both the weights (e.g., betas) and structure coefficients" (Henson & Thompson, 2002, p. 12).

The descriptive statistics for the subscales were run on SPSS as a multivariate model and the participant responses by organizational level can be seen in Table 11. The organizational levels are 1 through 9, with several of the organizational levels being of modest relative size to the total N. In particular, organizational level 6 an n of only one, while organizational level 5 had an n of only 4. The largest n was organizational level 1, which included 25 participants.

Table 11.
Descriptive Statistics for OCI© subscales by Organizational Level

	Organizational Level	Mean	Std. Deviation	N
Humanistic-Encouraging	1	31.40	9.197	25
	2	41.14	5.984	7
	3	34.11	6.694	18
	4	36.25	7.960	8
	5	32.50	5.447	4
	6	48.00	.	1
	9	32.80	10.640	5
	Total	34.10	8.438	68
Affiliative	1	32.40	8.342	25
	2	40.86	5.872	7
	3	34.44	6.922	18
	4	35.75	9.316	8
	5	34.50	3.697	4
	6	42.00	.	1
	9	33.20	10.232	5
	Total	34.53	7.945	68
Approval	1	29.16	8.513	25
	2	33.43	6.294	7
	3	29.73	6.843	18

	4	29.75	7.797	8
	5	32.50	3.873	4
	6	18.00	.	1
	9	29.00	10.488	5
	Total	29.84	7.686	68
Conventional	1	32.52	7.880	25
	2	33.57	8.522	7
	3	29.61	9.004	18
	4	29.38	9.133	8
	5	32.00	5.598	4
	6	17.00	.	1
	9	29.00	11.023	5
	Total	30.97	8.506	68
Dependent	1	35.84	7.431	25
	2	35.00	6.403	7
	3	32.33	9.343	18
	4	31.63	8.879	8
	5	27.50	7.326	4
	6	21.00	.	1
	9	33.00	6.285	5
	Total	33.41	8.134	68
Avoidance	1	26.16	9.244	25
	2	26.14	10.123	7
	3	24.78	9.290	18
	4	25.00	9.769	8
	5	29.75	8.180	4
	6	10.00	.	1
	9	24.40	11.845	5
	Total	25.50	9.389	68
Oppositional	1	24.16	4.964	25
	2	25.14	6.176	7
	3	22.72	3.968	18
	4	21.97	5.878	8
	5	25.00	3.742	4
	6	18.00	.	1
	9	23.40	6.877	5
	Total	23.53	4.977	68
Power	1	29.36	6.843	25
	2	29.57	9.502	7
	3	26.94	8.033	18
	4	26.88	7.240	8
	5	28.00	3.559	4

	6	16.00	.	1
	9	29.20	10.640	5
	Total	28.16	7.593	68
Competitive	1	29.08	8.221	25
	2	26.86	3.338	7
	3	27.28	9.241	18
	4	27.50	10.502	8
	5	26.25	5.737	4
	6	13.00	.	1
	9	26.80	11.389	5
	Total	27.62	8.477	68
Perfectionistic	1	30.83	6.831	25
	2	29.71	5.823	7
	3	27.67	7.460	18
	4	29.38	8.417	8
	5	29.75	3.403	4
	6	18.00	.	1
	9	29.40	11.104	5
	Total	29.35	7.258	68
Achievement	1	33.65	7.871	25
	2	38.71	5.559	7
	3	34.06	8.149	18
	4	36.00	7.131	8
	5	32.75	9.535	4
	6	44.44	.	1
	9	34.80	8.408	5
	Total	34.75	7.711	68
Self-Actualizing	1	29.08	7.571	25
	2	35.00	3.559	7
	3	31.17	6.989	18
	4	32.50	7.540	8
	5	29.00	4.163	4
	6	42.00	.	1
	9	31.20	9.311	5
	Total	30.99	7.164	68

The Box's M test of equality of covariance matrices is "a statistical test for the equality of the covariance matrices of the independent variables across the groups of the independent variable. If the p - calculated is greater than the critical level (e.g., .01), then the equality of the covariance matrices is supported" (Hair et al., 1998, p. 240). In this

Box's M test (Table 12), the p value was above the critical level of .01, and accordingly appeared to support the equality of the covariance matrices.

Table 12.

Box's M Test Results(a)

Box's M		383.119
F	Approx.	3.584
	df1	78
	df2	7174.833
	Sig.	.000

Tests null hypothesis of equal population covariance matrices.
a Some covariance matrices are singular and the usual procedure will not work. The non-singular groups will be tested against their own pooled within-groups covariance matrix. The log of its determinant is 39.751.

Table 13 presents multivariate tests for the OCI© data, including Pillai's trace, Wilks' lambda, and Hotelling's trace for the professional level. All were statistically significant ($p < .05$); however, at the organization level, none were statistically significant at the level of .05 level except for the Roy's largest root ($p = .043$).

Table 13.

Multivariate Tests (c) OCI© Questionnaire Responses

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Sqd.
Intercept	Pillai's Trace	.604	5.727(a)	12.000	45.000	.000	.604
	Wilks' Lambda	.396	5.727(a)	12.000	45.000	.000	.604
	Hotelling's Trace	1.527	5.727(a)	12.000	45.000	.000	.604
	Roy's Largest Root	1.527	5.727(a)	12.000	45.000	.000	.604
years_wi	Pillai's Trace	.318	1.745(a)	12.000	45.000	.089	.318
	Wilks' Lambda	.682	1.745(a)	12.000	45.000	.089	.318
	Hotelling's Trace	.465	1.745(a)	12.000	45.000	.089	.318
	Roy's Largest Root	.465	1.745(a)	12.000	45.000	.089	.318
Profession	Pillai's Trace	.367	2.173(a)	12.000	45.000	.030	.367
	Wilks' Lambda	.633	2.173(a)	12.000	45.000	.030	.367
	Hotelling's Trace	.579	2.173(a)	12.000	45.000	.030	.367
	Roy's Largest Root	.579	2.173(a)	12.000	45.000	.030	.367

Organization	Pillai's Trace	1.017	.851	72.000	300.000	.793	.170
	Wilks' Lambda	.313	.828	72.000	250.631	.827	.176
	Hotelling's Trace	1.339	.806	72.000	260.000	.861	.182
	Roy's Largest Root	.481	2.006(b)	12.000	50.000	.043	.325

(a).Exact statistic.
(b) The statistic is an upper bound on F yielding a lower bound on the significance level.
(c) Design: Intercept+years_wi+profession +organiza.

Table 14.

Estimated Marginal Means

Dependent Variable	Mean	Std. Error	95% Confidence Interval	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Humanistic-Encouraging	36.931(a)	1.593	33.740	40.121
Affiliative	36.157(a)	1.554	33.045	39.269
Approval	28.571(a)	1.553	25.459	31.683
Conventional	28.611(a)	1.676	25.254	31.967
Dependent	30.515(a)	1.592	27.326	33.705
Avoidance	23.654(a)	1.877	19.893	27.415
Oppositional	22.719(a)	.976	20.763	24.675
Power	26.566(a)	1.568	23.425	29.707
Competitive	25.134(a)	1.729	21.670	28.599
Perfectionistic	27.509(a)	1.435	24.635	30.384
Achievement	36.439(a)	1.480	33.474	39.405
Self-Actualizing	33.205(a)	1.350	30.500	35.911

a Covariates appearing in the model are evaluated at the following values: Years with Organization = 6.51, Profession/Occupation = 18.35, Are you a BB? = 1.94, Are you a certified GB? = 1.24, Are you an engineer? = 1.62.

Based on the discriminant function analysis and related tests, the null hypothesis that there is no statistically significant difference in the organizational culture and attitudes among the organizational levels examined, with the exception previously noted of the Roy's largest root result of .043, is not rejected based on the Pillai's trace, Wilks' lambda and Hotelling's trace results above. It should be noted that the respondent weighting may be affected by the relatively larger sizes of organizational levels 1 and 3, which had 26 and 24 respondents, respectively, representing in aggregate 53.2% of the 94 respondents.

In reviewing the Appendix IV OCI©/OEI™ Group Cultures, beginning with the CEO President: Executive/senior vice president (CEO), the strongest extensions are in the **Passive/Defensive** cluster.

Table 15.

The OCI© CEO president: Executive/senior vice president

With respect to the specific cultural styles, the…

Primary Style is **Avoidance**	Secondary Style is **Oppositional**
People are expected to: ▪ push decisions upward ▪ put things off ▪ never be the one blamed for problems	*People are expected to:* ▪ question decisions made by others ▪ be hard to impress ▪ point out flaws

Note. The items listed under the primary and secondary styles are those with the highest mean scores.

In each of the organizational levels analyzed, the primary culture style is Avoidance. The organizational level of CEO has a secondary Oppositional culture style as does the Black Belt. The Middle Management organizational level secondary style is Dependent, while both the Senior Management and the Green Belt organizational culture secondary style is Competitive. The Engineer organizational level has a secondary style of Conventional. The strongest extensions are in the Passive/Defensive cluster of the diagrams for the groups, except that of Black Belt, where, overall, the strongest extensions are in the Aggressive/Defensive cluster. Statistical significance is based on Student t-tests that compare the subgroup's raw scores to the raw scores of the other subgroups. Subgroup scores that are statistically significantly different from the rest of the organization are indicated by asterisks in the last column (*p<.05; **p<.01; ***p<.001). Statistically non-significant differences are indicated by "NS". In all

measured subgroups none appear to be statistically significantly different from the rest of the organization at the .05 level. These results complement and support the conclusion to not reject the null hypothesis, as they indicate that the primary style of the several organizational levels is the same for all levels (Appendix IV).

CHAPTER 5

DISCUSSION OF FINDINGS

This chapter discusses the findings and their relationship to the current knowledge base on performance management systems. This study considered several recent transformations in performance management tools, and investigated their effects and organizational cultural impacts on organizations.

Summary of Results

The Financial Implications of Implementing Six Sigma

The study considered the financial implications of Six Sigma's implementation at JEA. Empirical analyses supported that there was economic value added through implementation of the program. The analysis indicated that the aggregate savings for the period under investigation (fiscal years 2000 through fiscal year 2006) were projected to be $84,928,000, and that the savings were achieved by both the electric system at $10,275,000 and the water and sewer system at $74,653,000. As stated previously, the results were then tested with the Minitab Test of Two Proportions and there was a statistically significant difference.

This savings result was also confirmed through interviews with the executives, who each confirmed that there had been a substantial savings achieved over the period under investigation. Big Bear, for example, said,

> Since JEA implemented it [Six Sigma], we have provided for improved electric reliability and for EFOR [equivalent forced outage rates] improvements and improvement in equivalent availability of our electric generating units, improved water quality, and so forth. And I don't think we would have improved as much without Six Sigma, although I think we were on the road to improving, … with Six Sigma we have had an enormous focus on improvements of processes.

Organizational Cultural Perceptions of Implementing a Performance Management System

According to Ashkanasy, Wilderom, and Peterson (2000), "culture and climate share the common ground of trying to describe and explain the relationships that exist among groups of people who share some sort of common situation/experience" (p. 166). Often that shared common ground in corporations is due to training. As was discussed in chapter 3, continuous training is a critical element in Six Sigma and crucial to the statistically based continuous process improvement structure. Without a long term training program, Six Sigma cannot be successfully implemented. According to Perez-Wilson (1999), full implementation of Six Sigma takes a number of years. At JEA, the Six Sigma training was implemented system wide in fiscal year 2000 with the executive level managers, and then introduced to the entire cadre of managers and appointed staff with the reorganization in 2001.

A recent article by Kemp et al. (2001) on cultural resistance to change discussed the cultural components of various types of institutional culture, and emphasized the importance of understanding organizational culture when initiating change. The concept

of organizational structure understanding is important to the analysis of the element of resistance to change, and they described elite, meritocratic, or leadership-style value structures as more likely to view change negatively, versus a collegial structure, which they felt would view change in a more positive way.

Sorensen (2002), who studied organizational cultures, described a research study in which the analysis showed that organizations with strong organizational cultures had results indicating that reductions in performance variability would be achieved, thus benefiting the firm. He showed that where firms had a strong organizational culture, they would be more likely to under-invest in new business activities, since they would have cash flows that were more predictable and less volatile. His conclusions indicated that organizations with strong cultures were able to benefit since they not only were able to increase staff motivation, thereby facilitating coordination and control, they could also create competitive advantage through being in a stronger position to take advantage of opportunities that might arise.

Pervasiveness of culture implementation "refer[s] to the range of beliefs and behaviors that the culture attempts to define and control" (Ashkanasy et al., 2000, p. 167). They gave as an example IBM management's attempt in the 1970s to influence how their staff dressed and behaved at work. As the interview participants described, there was resistance to the implementation of Six Sigma at JEA. According to several members, at least some of this resistance occurred as a result of the top down mandated "one size fits all" implementation with little explanation to staff of the benefits. Southside Sioux, one of the executives interviewed, stated,

> JEA had driven its implementation, and was too hasty in trying to see benefits. People should have been able to get a much better understanding of what can be measured, and what should be measured; quality, effectiveness, process improvement, timeliness. Six Sigma has improved productivity in some areas which are data rich, but when JEA implemented in it a "one size fits all" format, it was not as effective since one size does not fit all.

This was further elaborated on by another executive, Bull, whose business unit experienced a net loss of productivity when implementing Six Sigma, due to the uniqueness of the unit's activities – marketing, market research, rates, etc. Bull's unit was a strategic corporate planning area with no or little repetitive nature to its activities. It was not a process based unit, so the implementation mapping activities resulted in a certain amount of "force fitting" of the metrics in an attempt to implement the program. However, despite the resistance, as stated by one executive, Aphrodite, "JEA has definitely seen the results from Six Sigma." This was an observation shared by nearly all of the interviewees, that Six Sigma had been a successful performance management system, with real results and impacts on organizational culture.

The survey instrument statistical analysis was reviewed and discussed in the preceding chapter, and the result of the analyses performed confirmed (failed to reject) the null hypothesis that there is no difference in the organizational cultural perceptions among the organizational groups investigated. In terms of the model discussed by Ashkanasy et al. (2000), this suggests an organizational culture which is highly integrated, where there appears to be consensus throughout the organization, and

accepted by the members as “deeply held values with many operating at the level of the ‘taken for granted’” (Ashkanasy et al., p. 168).

The significance of the highly integrated organizational culture is one of being able to link organizational performance with the organizational culture. In recent years, this has been an area of significant research, and was affected by the success of the Japanese industry adopting the TQM program.

> This indirect or implicit attention for the C-P evidence changed at the end of the 1970s, at which time explanations for the world-wide success of Japanese firms were being sought. At the forefront of this movement, Ouchi drew attention to the importance of workers’ commitment. (Ashkanasy et al., 2000, p. 195).

This observation was reflected in Pathfinder’s comments:

> What is different now is that we view the organization as processes, and output as products and services delivered, not just activities. Now JEA is more customer oriented, and we use the VOC principles from TQM and Six Sigma to make sure we are using the data to make decisions. Now there is less human element [tribal knowledge] and the focus is on the process not the people involved. It’s been hard to get people to accept process error, as people tend to be more about processes, now and focused on the data and facts, not on feelings or emotions.

Synthesis of the Findings

As discussed in chapter 4, there were a number of general themes identified through the interviews with the executive managers. Among the general themes that resonated among the executives was that the implementation of Six Sigma was expected

to provide for improvement in operating results and also to bring a cultural standard for quality and operations measurements. Another theme identified by the participants was the organizational culture change management and the related subthemes of culture change and a common language. One executive, Aphrodite, summed up the culture change, stating that "the implementation of Six Sigma has changed the culture. --- [and] now the company has shifted to focusing on the data."

The interviewees thought it was important to understand Six Sigma as a common language, and, as such, that training was very important. Several of the executives described the change management effects of implementing Six Sigma throughout the company. An example given by Valkyrie, relevant to this theme was a meeting where there were five different teams from various areas of the company who were all able to share "a common language, and [who] understood a common set of tools." This shared language and tools enabled employees to better focus on areas of concern. The interviewees also felt that after the implementation of Six Sigma, the company was much more data driven.

> Now managers need data to make and support decisions versus just "tribal knowledge." Through the Six Sigma process improvement implementation, JEA also has attained a common language among the business managers. This is seen in business reviews, and how process improvement is achieved and reported.

All of the interviewees spoke to the general theme regarding improvements from implementing Six Sigma. One executive said, Six Sigma had "improved productivity in areas which are data rich. Six Sigma is a terrific tool set, and appropriately applied, can provide significant returns." For the subtheme, process mapping, the executives felt that

it is a good tool and the executives, as a group, were unanimous in their comments regarding process mapping, which they believed allowed JEA to come up with detailed processes and applications.

Generally, the executives also all commented on the theme regarding implementation, and ways in which the implementation could have been better. Significantly, similar statements were offered by a number of the executives regarding specific negatives about the implementation, including a top down "one size fits all" approach that seemed to create "silos." Bull said, "Cross functionality, which should have resulted, was impeded by the process based reorganization, and rather than improve it, gaps were created." Bull felt it would take years to identify the gaps created and then fix them. He called them "white spaces" in the organization, "that no one managed and where friction has evolved. The end results weren't coming through. This has created some negative perceptions."

Findings in Relationship to the Literature Review

One interesting additional observation that can be made is that the long and valuable history of organizational literature over the last century became very evident to the researcher during this study, as it proved to be of continuing value. Much of importance and value of the principles to be gleaned from the earlier writings were still evident in the subject study. The continuing truisms of the body of literature reviewed in the current study remain of import to the managers of organizations who seek to find ways to make their organizations more efficient and effective. Certainly, while the more recent literature review materials have improved on the depth, and viability, of the earlier writings and research, the study in question was benefited greatly and strengthened from

the inclusion of both these earlier ideas, principles and concepts, which were supported and embellished by the research enhancements gained over the past century.

Conclusions

In summary, as one executive put it, "JEA now has an environment which is one which now leverages Six Sigma projects, with matrix based operations and which ensures compliance. JEA has definitely seen the results from Six Sigma." The financial implications and organizational cultural perceptions of the implementation of a performance management system in a governmental enterprise are several. First, the research supported that the performance management system being investigated, Six Sigma, has had financial success at the organization. The data indicated that the financial implications were statistically significant, and the financial analysis that was performed quantified it as material and relevant to both of JEA's major business units. The interviews with the executives also found that they felt uniformly that the implementation of Six Sigma had had significant effects on the operating activities of those business units. An examination of the organizational cultural perceptions of the implementation was conducted through interviews of the executives who were, in large part, responsible for the implementation, and they generally confirmed the financial and statistical analyses. Finally, the organizational culture perceptions measured by the survey instrument were statistically analyzed and the results suggested that the organizational culture of the various groups examined is commonly shared. As a result, the null hypothesis was accepted: the data suggest that there is no difference in the organizational cultural perceptions among the groups investigated.

The inferential analysis from this study seeks to provide important information useful in evaluating performance management initiatives in a government enterprise. The discriminant function analysis design of the present study was limited to explorations of relationships between the organizational culture inventory variables from the survey instrument. Further, the specific conclusions that may be drawn from the analyses are valid only for the population of the study. Six Sigma, as the study demonstrated, has been of significant value at the subject of the study, JEA, a government enterprise. It's value has been demonstrated in two ways, with the financial implications explored by the present study it was determined to have contributed to cost containment of operating and maintenance expenses, and secondly, it has been shown to have contributed to the organizational culture socialization of the organization's employee workforce. The findings of this study may be of interest to other organizations and governmental entities that are engaged in or considering implementation of a performance management system such as Six Sigma.

Recommendations for Future Research

This study supports the need for more comprehensive studies of the performance management systems being used by government entities. Because this was an exploratory study, the sample was delimited to one government enterprise. Future researchers may be interested in exploring this topic further to determine whether other government enterprises can benefit from Six Sigma or other performance management systems. Further research of the financial implications and organizational cultural perceptions of implementing a performance management system should be conducted in other similar government organizations in order to more fully investigate the potential that these

performance management systems may offer to such entities in meeting their public objectives, controlling costs, and improving productivity. With regard as to whether this study may have inferential value to educational systems, certainly with regard to the statistical tools these performance management systems provide, those educational systems seeking ways to better manage their repetitive activities could be well served to consider them. Given the large body of evidence available in the literature as to the value of performance management systems, and the empirical results described in this study, strong consideration of implementing performance management systems in organizations seeking to improve should be undertaken.

As was stated previously, an important reason for a government organization to improve performance measurement is the indirect improvement in citizens' (JEA's rate payers) perceptions of government performance. The results obtained for this study clearly support the potential effectiveness of performance management systems and potential future use by governments and governmental enterprises which wish to respond successfully to citizens' subjective image of their performance can effectively describe their own objective performance results. Six Sigma's impact on performance improvement is a story that is well worth discussion and one that can help citizens evaluate the efficiency and effectiveness of the organization's management focus (Yang & Holzer, 2006).

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MEMORANDUM

DATE: October 4, 2006

TO: Hugh Van Seaton

VIA: Dr. Joyce Jones,
Leadership, Counseling and Technology

FROM: Dr. Kathaleen Bloom, Chair,
UNF Institutional Review Board

RE: Review by the UNF Institutional Review Board IRB#06-126:
"The Financial and Cultural Implications of Implementing a Performance Management System in a Government Enterprise"

This is to advise you that your project, "The Financial and Cultural Implications of Implementing a Performance Management System in a Government Enterprise," has been reviewed on behalf of the UNF Institutional Review Board and has been approved (Expedited/Category #9).

This approval applies to your project in the form and content as submitted to the IRB for review. Any variations or modifications to the approved protocol and/or informed consent forms as they relate to dealing with human subjects must be cleared with the IRB prior to implementing such changes. Any unanticipated problems involving risk and any occurrence of serious harm to subjects and others shall be reported promptly to the IRB.

IRB approval is valid for **one year**. If your project continues for more than one year, you are required to provide an annual status report to the UNF IRB.

Should you have any questions regarding your project or any other IRB issues, please contact Nicole Sayers, Coordinator of Research Compliance, at 620-2498.

Thank you.

Appendix II
Interview Questions

The Financial Implications and Organizational Cultural Perceptions of Implementing a Performance Management System in a Government Enterprise

General Background:

1. Please describe your role in the initial assessment of Six Sigma and who were the instrumental decision makers? Were other performance management systems examined? What were your expectations for the Six Sigma implementation?

2. Describe your view of Six Sigma's impact to your business unit, and to the organization. (possible: Do you feel Six Sigma has improved productivity in your area?)
3. Is your performance improvement initiative project driven?
   a. In what ways, please describe how you set goals, objectives?
   b. How are your performance improvement project initiatives set?
4. Has implementing Six Sigma affected the efficiency of the business unit?
5. What other types of performance improvement program does your business unit/organization presently employ, in addition to Six Sigma, or instead of Six Sigma?
6. What is different in the way your business unit/organization does its work, since Six Sigma was introduced?
   a. Have you observed changes in the ways that others work?
   b. Has implementing Six Sigma affected the social interactions or camaraderie of the business unit?
   c. How would you describe the current perception of performance improvement in your business unit?
   d. How would you describe the current perception of performance improvement in the organization?
7. Please describe your business unit's current Six Sigma status.
   (or: Please describe your organization's current Six Sigma status)
8. What are the future plans for using Six Sigma in your business unit?
   (or: What are the future plans for using Six Sigma in the organization?)
9. Please summarize your observations regarding Six Sigma, and its performance management usage in your organization?
10. What do you like about the Six Sigma performance improvement program?
    a. What would you like to change about Six Sigma?
    b. Could the implementation of Six Sigma have been better? If you believe that it could have, please describe how?

Are there any other comments, observations, regarding Six Sigma, or performance management systems you would like to add?

Fiscal Years	2005-06	2005-04	2004-03	2003-02	2002-01
Operating Revenues:					
Electric	1,160,463	$973,326	$840,210	$830,519	$793,685
Water and sewer	214,906	182,961	173,579	161,053	151,515
District Energy System	3,054	1,297	-	-	-
Other, net	49,454	42,299	54,803	44,147	38,485
Total operating revenues	1,427,877	1,199,883	1,068,592	1,035,719	983,685
Operating Expenses:					
Fuel and purchased power	599,426	494,721	409,690	371,074	345,843
Water & Sewer Operating & maintenance	87,926	80,660	79,506	69,046	72,616
Electric Operating & maintenance	194,355	176,617	174,469	186,006	168,584
Operations and maintenance	282,281	251,099	248,269	249,945	237,046
Operations and maintenance, per Annual Report	282,281	257,277	253,975	255,052	241,200
Electric Operations & Maintenance Expenses/MWh 1.385%		1.293%	1.312%	1.409%	1.429%
Water & Sewer Operations & Maintenance Expenses per Water CCF	0.158%	0.162%	0.158%	0.153%	0.167%
Water & Sewer Operations & Maintenance Expenses per Sewer CCF	0.246%	0.242%	0.241%	0.227%	0.260%
Operating Expenses % of Electric, Water & Sewer & District Energy Revenues	***20.48%***	***22.23%***	***24.49%***	***25.21%***	***25.08%***
Operating Expenses % of Total Revenues	***19.77%***	***21.44%***	***23.23%***	***24.13%***	***24.10%***
Fuel & Purchased Power % of Electric Revenues	***51.65%***	***50.83%***	***48.76%***	***44.68%***	***43.57%***
Depreciation	297,614	278,531	251,493	252,778	188,725
State utility and franchise taxes	26,807	21,791	18,941	19,323	18,120
Recognition of deferred costs/revenues	40,428	44,141	44,184	29,110	52,417
Total operating expenses	1,236,658	1,090,283	972,577	922,230	842,151
Operating Income	191,219	109,600	96,015	113,489	141,534

Fiscal Years	2001-00	2000-99	1999-98	1998-97	1997-96 *
Operating Revenues ($000 omitted)					
Electric	$800,445	$766,482	$754,478	$754,799	$711,252
Water and sewer	132,758	131,112	127,448	115,700	38,013
District Energy System	-	-	-	-	-
Other, net	43,828	30,378	29,543	24,857	37,612
Total operating revenues	977,031	927,972	911,469	895,356	786,877
Operating Expenses:					
Fuel and purchased power	404,487	368,171	299,400	302,956	290,731
Water & Sewer Operating & maintenance	65,329	67,069	64,378	63,487	65,604
Electric Operating & maintenance	141,529	149,063	147,322	148,952	144,473
Operations and maintenance	206,858	210,550	208,830	209,310	163,215
Operations and maintenance, per Annual Report	206,858	216,132	211,700	212,439	210,077
Electric Operations & Maintenance Expenses/MWh 1.159%		1.281%	1.259%	1.458%	1.394%
Water & Sewer Operations & Maintenance Expenses per Water CCF	0.171%	0.171%	0.168%	0.184%	0.203%
Water & Sewer Operations & Maintenance Expenses per Sewer CCF	0.265%	0.275%	0.269%	0.289%	0.310%
Operating Expenses % of Electric, Water & Sewer & District Energy Revenues	***22.17%***	***23.46%***	***23.68%***	***24.04%***	***21.78%***
Operating Expenses % of Total Revenues	***21.17%***	***22.69%***	***22.91%***	***23.38%***	***20.74%***
Fuel & Purchased Power % of Electric Revenues	***50.53%***	***48.03%***	***39.68%***	***40.14%***	***40.88%***
Depreciation	157,715	137,657	126,553	101,378	86,918
State utility and franchise taxes	17,654	16,671	16,561	16,488	15,497
Recognition of deferred costs/revenues	35,758	28,960	93,085	59,491	25,550
Total operating expenses	822,472	762,009	744,429	689,623	581,911
Operating Income	154,559	165,963	167,040	205,733	204,966

Combined Electric System, Bulk Power Supply System, St. Johns River Power Park System, Water and Sewer and District Energy System (1)

Fiscal Years	2005-06	2005-04	2004-03	2003-02	2002-01
Non-operating Revenues (Expenses) ($000 omitted):					
Earnings from The Energy Authority	21,910	17,382	15,924	14,593	9,156
Investment income	23,088	14,460	13,832	19,466	38,841
Interest on debt	(232,370)	(238,454)	(203,100)	(197,148)	(187,838)
Other interest	(1,600)	(1,246)	(1,167)	(1,178)	(1,154)
Allowance for funds used during construction	32,044	34,637	32,010	42,577	63,211
Water & Sewer Expansion Authority	(762)	(302)	-	-	-
Total non-operating revenues (expenses)	(157,690)	(173,523)	(142,501)	(121,690)	(77,784)
Income (loss) before contributions	33,529	(63,923)	(46,486)	(8,201)	63,750
Contributions (to) from:					
General fund, City of Jacksonville	(88,688)	(85,938)	(83,187)	(74,253)	(76,607)
Capital Contributions:					-
Water & Sewer Expansion Authority		(254)	-	-	
Developers and other	97,775	58,495	56,578	47,381	29,991
City of Jacksonville Better Jacksonville Plan	14,546	385	9,118	7,548	7,922
Transfer of water and sewer assets from the City of Jacksonville					
Total other revenues (expenses)		(27,312)	(17,491)	(19,324)	(38,694)
Change in net assets before extraordinary items and cumulative effect of an accounting change		(91,235)	(63,977)	(27,525)	25,056
Extraordinary item-gain (loss) debt extinguishments	-	-	-	-	-
Change in net assets	57,162	(91,235)	(63,977)	(27,525)	25,056
Net assets — beginning of period	1,383,079	1,474,314	1,538,291	1,565,816	1,540,760
Net assets — end of period	$1,440,241	$1,383,079	$1,474,314	$1,538,291	$1,565,816

Combined Electric System, Bulk Power Supply System, St. Johns River Power Park System, Water and Sewer and District Energy System (1)

Fiscal Years	**2001-00**	**2000-99**	**1999-98**	**1998-97**	**1997-96 ***
Non-operating Revenues (Expenses) ($000 omitted):					
Earnings from The Energy Authority	10,008	11,323	19,243	10,732	(1,520)
Investment income	52,467	39,322	32,020	55,776	59,158
Interest on debt	(166,302)	(165,296)	(156,103)	(147,971)	(146,645)
Other interest	(1,604)	(1,942)	(1,134)	(1,058)	(985)
Allowance for funds used during construction	62,709	29,097	14,443	12,143	3,320
Water & Sewer Expansion Authority	-	-	-	-	-
Total non-operating revenues (expenses)	(42,722)	(87,496)	(91,531)	(70,378)	(86,672)
Income (loss) before contributions	111,837	78,467	75,509	135,355	118,294
Contributions (to) from:					
General fund, City of Jacksonville	(73,638)	(71,434)	(66,494)	(61,568)	(55,836)
Capital Contributions:	-	-	-	-	-
Water & Sewer Expansion Authority				-	-
Developers and other	19,433	13,262	13,797	18,391	2,619
City of Jacksonville Better Jacksonville Plan	-	-	-	-	-
Transfer of water and sewer assets from the City of Jacksonville					580,144
Total other revenues (expenses)	(54,205)	(58,172)	(52,697)	(43,177)	526,927
Change in net assets before extraordinary items and cumulative effect of an accounting change	57,632	20,295	22,812	92,178	645,221
Extraordinary item-gain (loss) debt extinguishments	-	(33)	(2,124)	(2,353)	200
Change in net assets	57,632	20,262	20,688	89,825	651,632
Net assets — beginning of period	1,483,128	1,462,866	1,442,178	1,352,353	700,721
Net assets — end of period	$1,540,760	$1,483,128	$1,462,866	$1,442,178	$1,352,353

JEA - Analysis of Potential Savings Fiscal Years 2000 – 2006 ($ Millions):

Proforma Operating Expenses, based on the % for FY 1997-1999 as the base for calculations ($ Millions):	***FY06 Units* Base***	***FY05 Units* Base***	***FY04 Units* Base***	***FY03 Units* Base***	***FY02 Units* Base***	***FY01 Units* Base***	***FY00 Units* Base***	***FY99-96 Average O & M***
Electric System								
Megawatt Hours sold (MWh)	16,684	16,238	15,953	16,117	15,212	15,222	14,576	
Electric System Megawatt Hours Sold (000)*	14,035	13,660	13,296	13,205	12,228	12,216	11,636	
Proforma Electric System Operating and Maintenance Expenses	186.7	181.7	176.9	175.7	162.7	162.5	154.8	
Actual Electric System Operating and Maintenance Expenses	194.5	176.6	174.5	186.0	168.6	141.5	149.0	1.330%
Actual Savings Versus Proforma Operating and Maintenance Expenses	(7.658)	5.098	2.403	(10.347)	(5.919)	20.972	5.727	
Water & Sewer System								
Water CCFs (000 omitted)	55,732	49,711	50,256	45,113	43,440	38,130	39,239	
Water & Sewer System Sewer CCFs	35,762	33,346	33,038	30,381	27,912	24,640	24,422	
Total Water & Sewer System Sewer CCFs	91,494	83,057	83,295	75,494	71,352	62,769	63,661	
Proforma Water and Sewer System Operating and Maintenance Expenses	102.8	93.3	93.6	84.8	80.2	70.5	71.5	
Actual Water and Sewer System Operating and Maintenance Expenses	87.9	80.7	79.5	69.0	72.6	65.3	67.1	0.112%
Actual Savings versus Proforma Operating and Maintenance Expenses	14.883	12.668	14.090	15.784	7.560	5.203	4.465	
Actual Savings versus Proforma Annual Total	7.225	17.766	16.492	5.437	1.641	26.175	10.192	
Aggregate Actual Savings versus Proforma	**$84.928**							

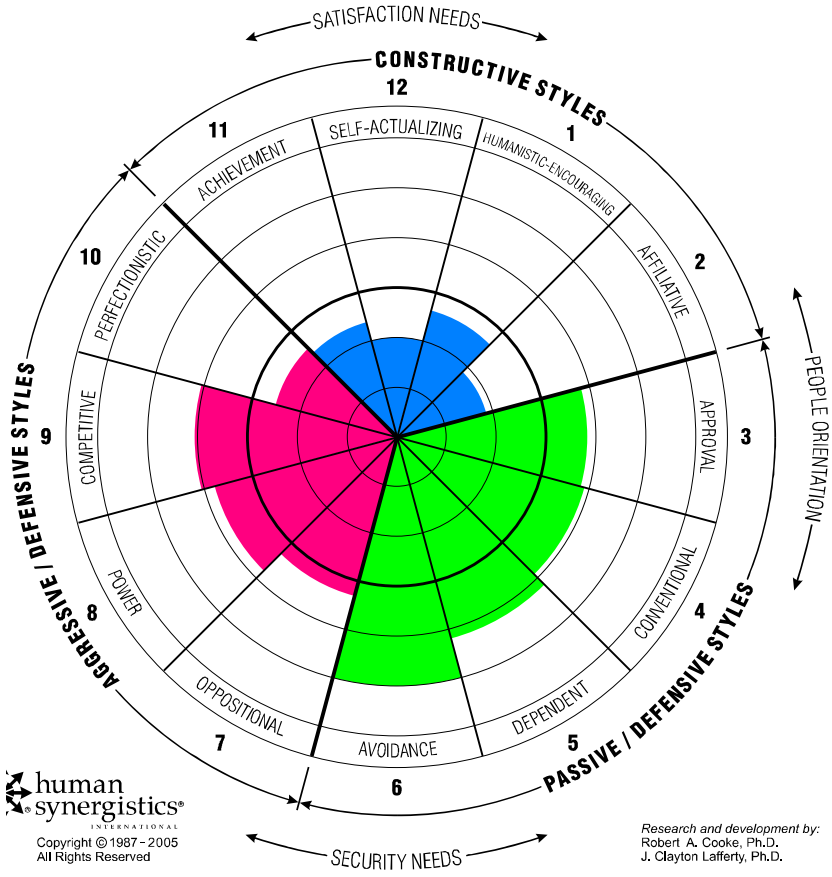
* Excludes FPL saleback

JEA Analysis of Potential Savings Fiscal Years 2000 - 2006:
($000 omitted)

Electric System Analysis:	
Fiscal Year 2000-2006 Aggregate MWh	90,275,817
Proforma Electric System Operating and Maintenance Expenses	$1,200,898
Actual Electric System Operating and Maintenance Expenses	1,190,623
Electric System - Aggregate Savings Proforma versus Actual	10,275
Water and Sewer System Analysis:	
Fiscal Year 2000-2006 Total Water & Sewer System Sewer CCFs	531,121,649
Proforma Water and Sewer System Operating and Maintenance Expenses	$596,805
Actual Water and Sewer System Operating and Maintenance Expenses	522,152
Water and Sewer System - Aggregate Savings Proforma versus Actual	$74,653
Aggregate Actual Savings versus Proforma	**$84,928**

Organizational Level: Middle management

Current Operating Culture
N=23



Overall, the strongest extensions are in the **Passive/Defensive** cluster.

With respect to the specific cultural styles, the…

Primary Style is **Avoidance**

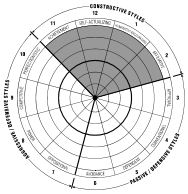
People are expected to:
- take few chances
- push decisions upward
- make "popular" rather than necessary decisions

Secondary Style is **Dependent**

People are expected to:
- please those in positions of authority
- do what is expected
- willingly obey orders

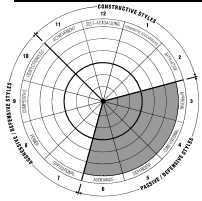
Note. The items listed under the primary and secondary styles are those with the highest mean scores.

Organizational Level: Middle management

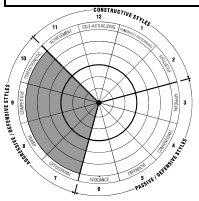


Current Operating Culture
N=23

Constructive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Humanistic 41%		34.26	6.52	Moderate	NS
Affiliative 2	3%	34.61	6.79	Moderate	NS
Achievement 35%		34.78	7.99	Low	NS
Self-Actualizing 25%		31.06	6.83	Low	NS



Passive/Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Approval 71%		29.61	6.54	Moderate	NS
Conventional 73%		30.30	8.38	Low	NS
Dependent 78%		32.91	7.60	Very Low	NS
Avoidance 90%		25.29	8.54	Very Low	NS



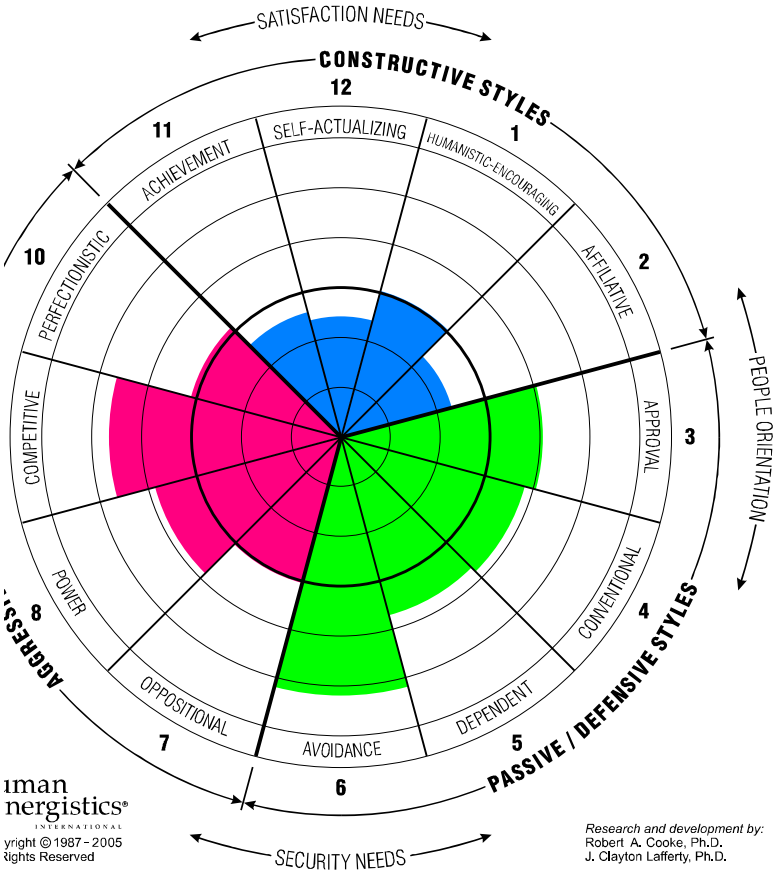
Aggressive/ Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Oppositional 58%		22.50	3.97	High	NS
Power 70%		26.54	7.43	Low	NS
Competitive 7	6%	25.62	7.39	Low	NS
Perfectionistic 38%		27.65	6.42	Moderate	NS

[a] Significance is based on *Student t-tests* that compare the subgroup's raw scores to the raw scores of the other subgroups. Subgroup scores that are significantly different from the rest of the organization are indicated by asterisks in the last column (**p*<.05; ***p*<.01; ****p*<.001). Non-significant differences are indicated by "NS."

Organizational Level: Senior management

Current Operating Culture

N=9



Overall, the strongest extensions are in the **Passive/Defensive** cluster.

With respect to the specific cultural styles, the…

Primary Style is **Avoidance**

People are expected to:

- make "popular" rather than necessary decisions
- never be the one blamed for problems
- push decisions upward

Secondary Style is **Competitive**

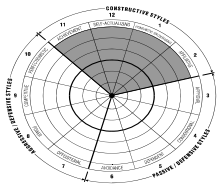
People are expected to:

- be a "winner"
- always try to be right
- out-perform their peers

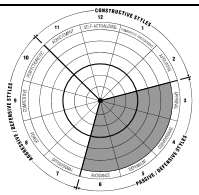
Note. The items listed under the primary and secondary styles are those with the highest mean scores.

Organizational Level: Senior management

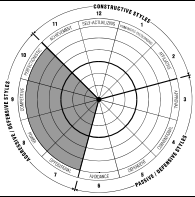
Current Operating Culture
N=9



Constructive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Humanistic 51%		35.56	7.73	Low	NS
Affiliative 3	3%	35.89	8.72	Low	NS
Achievement 40%		35.22	7.07	Low	NS
Self-Actualizing 36%		32.33	7.07	Low	NS



Passive/Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Approval 76%		30.22	7.43	Low	NS
Conventional 71%		30.11	8.82	Very Low	NS
Dependent 68%		31.78	8.32	Very Low	NS
Avoidance 92%		26.00	9.62	Very Low	NS



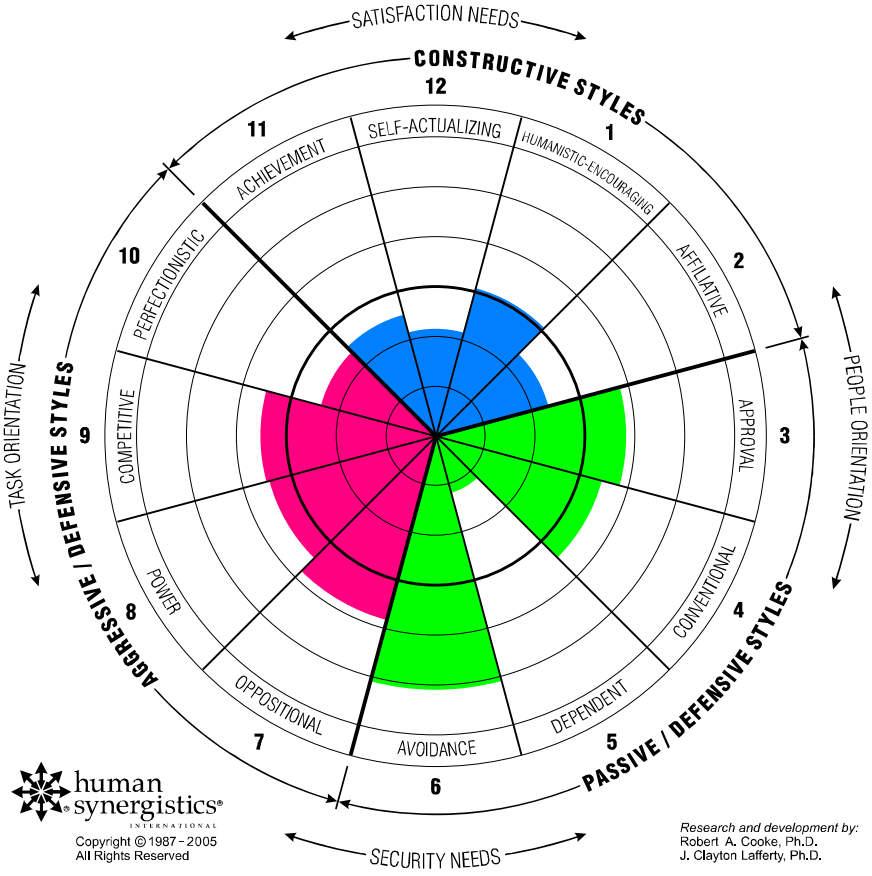
Aggressive/ Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Oppositional 51%		21.98	5.50	Low	NS
Power 72%		26.89	6.77	Moderate	NS
Competitive 8	5%	27.44	9.82	Very Low	NS
Perfectionistic 53%		29.44	7.88	Low	NS

[a] Significance is based on *Student t-tests* that compare the subgroup's raw scores to the raw scores of the other subgroups. Subgroup scores that are significantly different from the rest of the organization are indicated by asterisks in the last column (**p*<.05; ***p*<.01; ****p*<.001). Non-significant differences are indicated by "NS."

CEO President: Executive/Senior Vice President

Current Operating Culture

N=5



Overall, the strongest extensions are in the **Passive/Defensive** cluster.

With respect to the specific cultural styles, the…

Primary Style is **Avoidance**

People are expected to:

- push decisions upward
- put things off
- never be the one blamed for problems

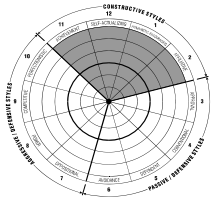
Secondary Style is **Oppositional**

People are expected to:

- question decisions made by others
- be hard to impress
- point out flaws

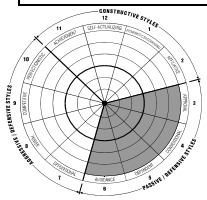
Note. The items listed under the primary and secondary styles are those with the highest mean scores.

CEO President: Executive/Senior Vice President

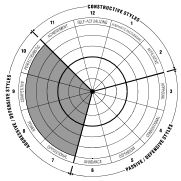


Current Operating Culture
N=5

Constructive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Humanistic 52%		35.60	8.38	Low	NS
Affiliative 3	4%	36.00	4.64	High	NS
Achievement 38%		35.09	9.77	Very Low	NS
Self-Actualizing 29%		31.60	6.84	Low	NS



Passive/Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Approval 71%		29.60	7.30	Low	NS
Conventional 62%		29.00	8.28	Low	NS
Dependent 13%		26.20	6.98	Low	NS
Avoidance 91%		25.80	11.32	Very Low	NS



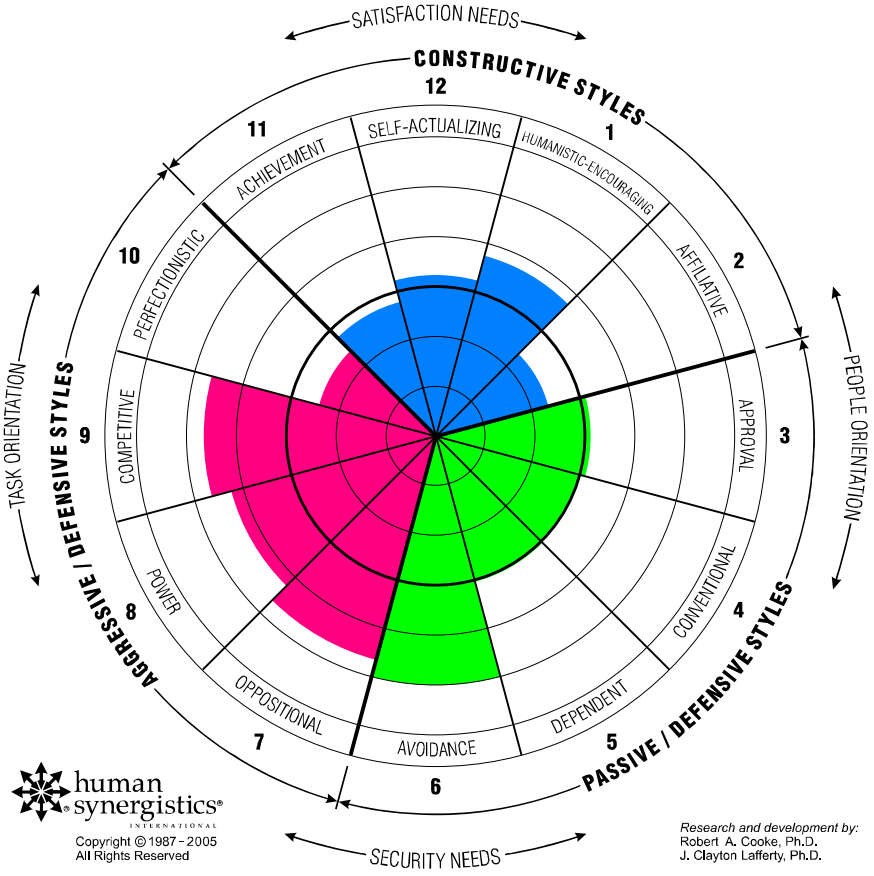
Aggressive/ Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Oppositional 71%		23.60	4.51	Moderate	NS
Power 62%		25.60	6.19	Moderate	NS
Competitive 6	3%	23.60	7.73	Low	NS
Perfectionistic 35%		27.40	6.02	Moderate	NS

[a] Significance is based on *Student t-tests* that compare the subgroup's raw scores to the raw scores of the other subgroups. Subgroup scores that are significantly different from the rest of the organization are indicated by asterisks in the last column (**p*<.05; ***p*<.01; ****p*<.001). Non-significant differences are indicated by "NS."

Are you a Black Belt: Yes

Current Operating Culture

N=4



Overall, the strongest extensions are in the **Aggressive/Defensive** cluster.

With respect to the specific cultural styles, the…

Primary Style is **Avoidance**

People are expected to:

- make "popular" rather than necessary decisions
- shift responsibilities to others
- "Lay low" when things get tough

Secondary Style is **Oppositional**

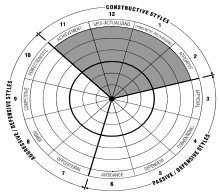
People are expected to:

- look for mistakes
- question decisions made by others
- remain aloof from the situation

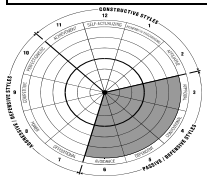
Note. The items listed under the primary and secondary styles are those with the highest mean scores.

Are you a Black Belt: Yes

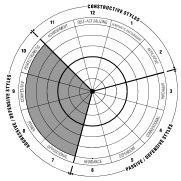
Current Operating Culture
N=4



Constructive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Humanistic 69%		37.50	3.32	Very High	NS
Affiliative 3	4%	36.00	6.78	Moderate	NS
Achievement 45%		36.00	5.89	Moderate	NS
Self-Actualizing 56%		34.00	6.16	Moderate	NS



Passive/Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Approval 53%		27.75	9.07	Very Low	NS
Conventional 50%		27.75	11.32	Very Low	NS
Dependent 51%		30.25	10.81	Very Low	NS
Avoidance 90%		25.50	12.50	Very Low	NS



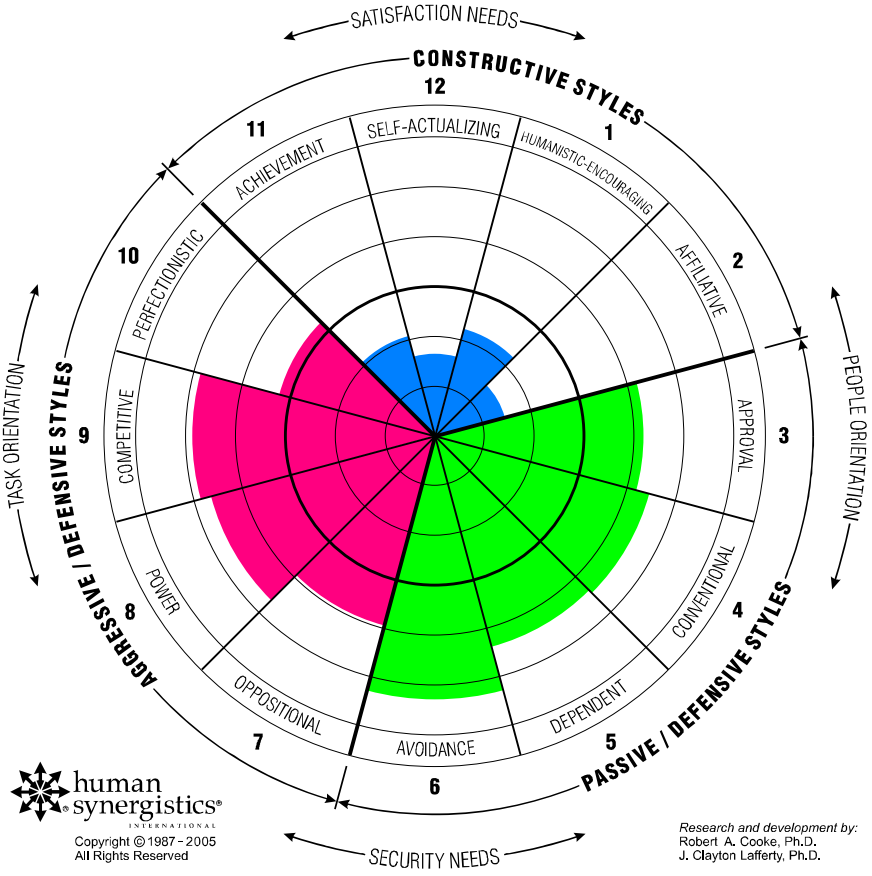
Aggressive/ Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Oppositional 85%		25.25	8.73	Very Low	NS
Power 79%		27.75	12.53	Very Low	NS
Competitive 8	5%	27.25	9.03	Low	NS
Perfectionistic 36%		27.50	8.89	Very Low	NS

[a] Significance is based on *Student t-tests* that compare the subgroup's raw scores to the raw scores of the other subgroups. Subgroup scores that are significantly different from the rest of the organization are indicated by asterisks in the last column (**p*<.05; ***p*<.01; ****p*<.001). Non-significant differences are indicated by "NS."

Are you a Certified Green Belt: Yes

Current Operating Culture

N=58



Overall, the strongest extensions are in the **Passive/Defensive** cluster.

With respect to the specific cultural styles, the…

Primary Style is **Avoidance**

People are expected to:

- make "popular" rather than necessary decisions
- never be the one blamed for problems
- take few chances

Secondary Style is **Competitive**

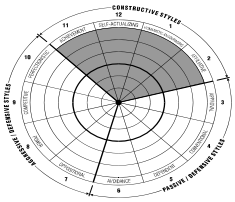
People are expected to:

- be a "winner"
- be seen and noticed
- always try to be right

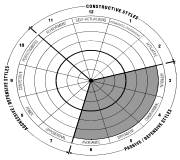
Note. The items listed under the primary and secondary styles are those with the highest mean scores.

Are you a Certified Green Belt: Yes

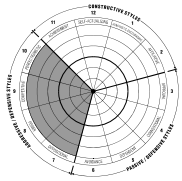
Current Operating Culture
N=58



Constructive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Humanistic 31%		32.90	8.08	Low	NS
Affiliative 1	7%	33.47	7.69	Low	NS
Achievement 27%		33.95	7.93	Low	NS
Self-Actualizing 20%		30.41	7.14	Low	NS



Passive/Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Approval 78%		30.59	7.71	Low	NS
Conventional 82%		31.59	8.15	Low	NS
Dependent 81%		33.57	8.12	Very Low	NS
Avoidance 93%		26.37	8.85	Very Low	NS



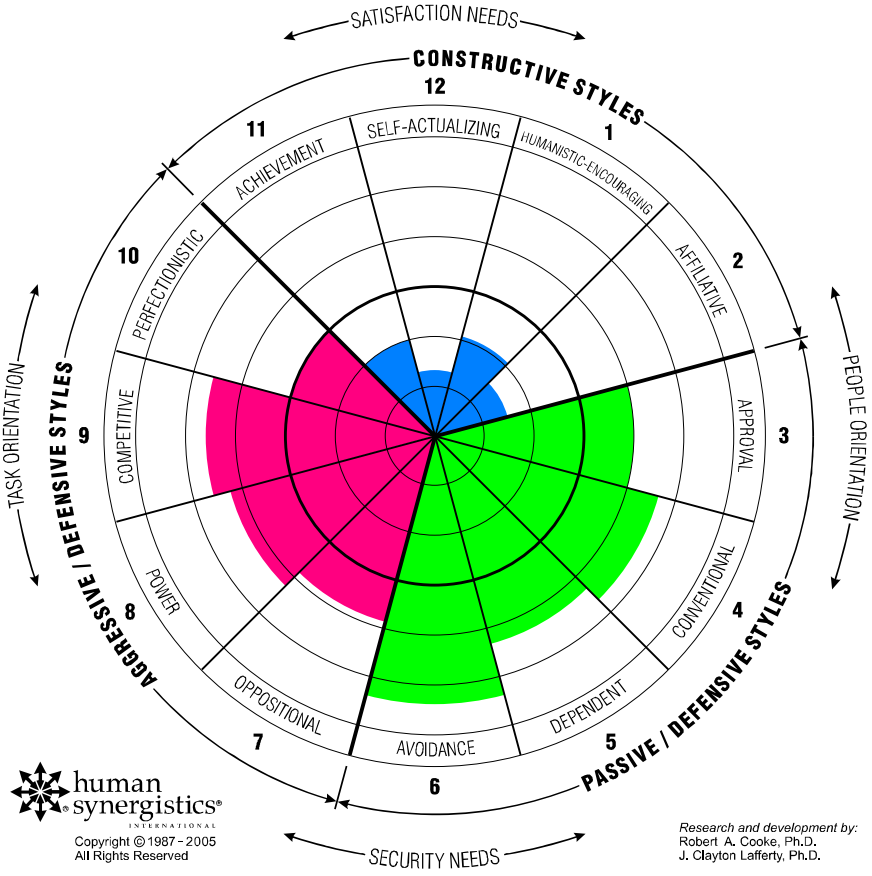
Aggressive/ Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Oppositional 74%		23.84	4.85	Moderate	NS
Power 85%		29.05	7.68	Low	NS
Competitive 8	8%	28.10	8.26	Low	NS
Perfectionistic 56%		29.74	7.34	Low	NS

[a] Significance is based on *Student t-tests* that compare the subgroup's raw scores to the raw scores of the other subgroups. Subgroup scores that are significantly different from the rest of the organization are indicated by asterisks in the last column (**p*<.05; ***p*<.01; ****p*<.001). Non-significant differences are indicated by "NS."

Are You an Engineer: Yes

Current Operating Culture

N=30



Overall, the strongest extensions are in the **Passive/Defensive** cluster.

With respect to the specific cultural styles, the…

Primary Style is **Avoidance**

People are expected to:

- make "popular" rather than necessary decisions
- push decisions upward
- take few chances

Secondary Style is **Conventional**

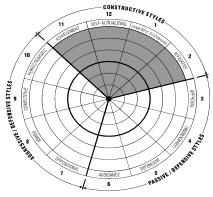
People are expected to:

- make a "good impression"
- conform
- always follow policies and practices

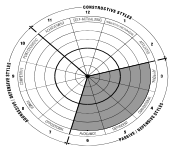
Note. The items listed under the primary and secondary styles are those with the highest mean scores.

Are You an Engineer: Yes

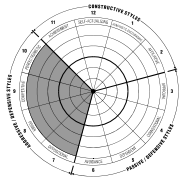
Current Operating Culture
N=30



Constructive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Humanistic 27%		32.50	8.87	Low	NS
Affiliative 1	8%	33.73	8.26	Low	NS
Achievement 25%		33.66	8.07	Low	NS
Self-Actualizing 15%		29.63	6.78	Low	NS



Passive/Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Approval 75%		30.17	7.59	Low	NS
Conventional 85%		32.17	8.77	Very Low	NS
Dependent 80%		33.30	8.49	Very Low	NS
Avoidance 94%		26.63	9.98	Very Low	NS



Aggressive/ Defensive Styles	Percentile Score	Raw Score	Std. Deviation	Intensity (Based on SD)	Significant Differences[a]
Oppositional 72%		23.76	5.19	Moderate	NS
Power 79%		27.80	7.29	Low	NS
Competitive 8	4%	27.00	9.23	Very Low	NS
Perfectionistic 50%		29.07	7.23	Low	NS

[a] Significance is based on *Student t-tests* that compare the subgroup's raw scores to the raw scores of the other subgroups. Subgroup scores that are significantly different from the rest of the organization are indicated by asterisks in the last column (**p*<.05; ***p*<.01; ****p*<.001). Non-significant differences are indicated by "NS."

JEA

The researcher is a manager, in the financial services division of JEA. JEA is the electric, water, and sewer utility system owned by the City of Jacksonville. It presently employs in excess of 2,300 people, including the staff of St. Johns River Power Park, which is a joint venture electric power generation station of JEA and Florida Power and Light Co., Inc. JEA is a body politic and corporate organized and existing under the laws of the State of Florida and is an independent agency of the City of Jacksonville, Florida (the "City"). The City is a consolidated city-county local government for Duval County, located in Northeast Florida. The governing body of JEA (the "JEA Board") consists of seven members appointed by the Mayor of the City and confirmed by the City Council of the City (the "Council"). JEA was established in 1968 to own and manage the electric utility which had been owned by the City since 1895 (the "Electric System").

In 2005, the latest year for which such information is available, JEA was the eighth largest municipally-owned electric utility in the United States in terms of number of customers. During Fiscal Year 2006, the Electric System served an average of 402,142 customer accounts in a service area which covers virtually the entire City. JEA also sells electricity to retail customers and two electric systems in neighboring counties.

The Water and Sewer System's service territory includes (a) virtually the entire City, other than the beach communities (Jacksonville Beach, Atlantic Beach and Neptune Beach), the Town of Baldwin, the active United States Navy facilities located within the City, (b) approximately 143 square miles in St. Johns County, which is southeast of the City and (c) approximately 620 square miles in Nassau County, which is north of the

City. In addition, the Water and Sewer System serves a small number of customers in Clay County, which is southwest of the City. The Water System served an average of 293,689 customer accounts in Fiscal Year 2006. The Sewer System, which served an average of 219,810 customer accounts in Fiscal Year 2006.

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PROFESSIONAL EXPERIENCE

JEA *1999-* *Present*

- **Manager, Capital Project Financing** and Six Sigma Certified Green Belt. Develop and implement long term financing strategy to minimize financing costs and guarantee availability of funding sources for JEA capital initiatives.
- Manage over $5.7 billion of publicly issued bonds, including several floating to fixed rate swap synthetic refundings; issued and refunded over $6 billion of bonds in past five years. Manage JEA's outside financing team. Responsible for investor relations.
- **Budget Team Leader**. Managed the development, coordination, analysis and periodic status reporting, of the JEA Annual Operating and Maintenance and Capital budgets

BANK OF SCOTLAND *1990* *–1999*

Regional Director, Southeast Region

- Managed highly profitable Region; mergers and acquisitions (M & A) and leveraged buy-out (LBO) financing with participation in over 25 acquisition credit facilities. Successfully led underwriting team in financing and syndicating agency role for over $250 million of bonds; including floating to fixed interest rate swaps.
- Prepared the Strategic Plan, and the Community Reinvestment Act application submitted to the Federal Reserve Board, for Bank of Scotland's "New Bank" (a subsidiary).

MARINE MIDLAND BANK, New York, NY

Senior Vice President, Investment Services Division *1986 – 1990*

- Director of Private Banking Department, and Manager of Park Avenue Branch; $500+ million of Assets and Senior Vice President, Chief Operating Officer and Chief Financial Officer, Chronogram Corporation, national financial planning organization.

Administrative Vice President, International Banking Division *1980 – 1986*
Asia – Pacific Area Manager; Administrative Vice President

- Managed Asian commercial banking activities, Assets of $2+ billion; budgets for staff of 110 located in New York, Tokyo, Seoul and Hong Kong, including three branch offices. Doubled Asia –Pacific commercial credit volume, increasing assets by over $1 billion; tripled profitability.

FEDERAL DEPOSIT INSURANCE CORPORATION, St. Louis, MO

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